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TUBERCULIN TREATMENT AMONG DISPENSARY PATIENTS.

By Louis Hamman, M. D.,
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AND

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In the last five years a great deal has been written about the care of tuberculous patients in their homes, and the success that follows such a method of painstaking treatment even amongst the poor. During the past two years we have had in the Phipps Dispensary of the Johns Hopkins Hospital constantly under our control a group of from thirty to fifty patients, whose mode of life has been strictly supervised. In addition they have been treated with tuberculin, and it is this feature of the work that we wish particularly to emphasize. There is a widespread reawakening of interest in tuberculin treatment, and although we have followed generally recognized methods of procedure we have thought that it might not be without interest to tell how their application has succeeded in the dispensary. Whatever the ultimate verdict about the value of tuberculin may be we believe that much of the evidence should come from its use among outpatients. A dispensary has some advantages over a sanatorium which should not be neglected, and although many difficulties must be overcome they are by no means insurmountable. What we have to say is no proof of the value of tuberculin in the treatment of pulmonary tuberculosis nor is it even an argument in favor of its use. We have of course acquired certain impressions which we do not hesitate to state, but they are only impressions. What we believe we have shown is that tuberculin may be used on a large scale in the dispensary without danger and under the most satisfactory control.

The Selection of Patients.

As tuberculin treatment requires much time and care we have up to the present been able to extend its use to only a small number of the patients who come to the dispensary. These have been selected according to definite requirements. A degree of intelligence is essential, and many lack even this small range. Willingness to undergo a long and often tedious cure and faithfulness and dependability in carrying out instructions must be considered. A certain amount of home comfort, too, and enough leisure to allow regular attendance at the dispensary are demanded. These particulars have been our guide in the selection of the patients and not the stage or extent of their disease. We have taken early, moderately advanced and far advanced cases and a few who were evidently on the last leg of their downward course. The response of the patients has been on the whole satisfactory. Some, after a short period of treatment, have left as the result of conflicting demands that they considered more urgent, and a few were discharged on account of hopeless indifference. In any group of patients one is bound to have a few trifling malcontents who breed general dissatisfaction, but the morale of the group has been readily re-established by their summary dismissal. Everything is done to impress the patients with the important bearing their earnestness and faithfulness will have on the success of the treatment. From their own records largely we must judge of their progress and be guided in the treatment, and these are the object of particular review and surveillance.

The Control of Patients.

When a patient is selected for treatment with tuberculin he is referred to the visiting nurse, who schools him in taking his temperature and pulse and explains the method of recording his symptoms and the main features of his daily life. In the beginning blank note books were used, later books similar to the ones used by Pratt, of Boston (Mass.), which were

Date:							
Temperature - - 8 A. M.							
12 N.							
4 P. M.							
8 P. M.							
Pulse - - - - - 8 A. M.							
12 N.							
4 P. M.							
8 P. M.							
Weight:							
Tuberculin: Dose							
Place of Injection: Pain							
Swelling							
Enlarged Glands							
Symptoms: Appetite							
Digestion							
Nausea							
Vomiting							
Headache							
Chilliness							
Pain in Joints							
Sleep							
Nervousness							
Strength: As usual							
Increased							
Decreased							
Cough: As usual							
Increased							
Decreased							
Sputum: As usual							
Increased							
Decreased							
Blood in Sputum							
Pain in Chest							
Shortness of Breath							
Rest: In Bed							
Sitting down							
Exercise							
In open air							
Diet: Milk							
Eggs							
Oil							
Total gain in weight							

This facsimile is two-thirds of the actual size.

modeled after those of Miner, of Asheville (N. C.), and in the past eight months special record books modified from those used by Brown in the Adirondack Cottage Sanitarium. The accompanying specimen sheet illustrates their scope. They have proved satisfactory and compact, each book of twenty-five pages lasting six months. On the inside of the cover the following directions are printed:

Now that you are to begin to take tuberculin it is important that you pay the greatest attention to keeping this record carefully and conscientiously. Whether we increase or decrease the amount of tuberculin you are receiving will depend entirely upon how you have stood the preceding dose and the only way we can judge of this is from the record you keep. Your improvement depends then to a large extent upon the faithfulness with which you keep your record. Never put down a temperature unless you are sure of it, and never make any entry until you are sure that you understand the book.

Each page in this book will keep your record for a week.

As you see, there are seven columns. Put the date at the top of the column and make a note after each symptom in the space immediately opposite it. You fill in each space every day, except the "tuberculin" space, which the doctor will fill in. After each symptom, if you have it, make a + mark. If you haven't it, make a 0. After "appetite," "digestion," "sleep" write "good" or "poor" as may suit the case. Under the heading "rest" write how many hours spent in bed, how many resting in a chair. In filling in the number of hours spent in the open air include those spent in bed if you sleep on a porch or with your windows out. Under "diet" put down the number of pints of milk, the number of eggs and the number of tablespoonfuls of oil. If you have any symptom, no matter how trivial it may seem to you, which is not in this book tell the doctor about it at your next visit.

From the time of this preliminary conference to the end of the treatment the nurse is the essential factor in the successful control of the patient. The records are simple and their management usually grasped after a single explanation, but in the beginning continuous vigilance is necessary to avoid often surprisingly gross errors. After a few weeks' supervision there is no longer any difficulty.

The following day the nurse visits the patient in his home and becomes intimately acquainted with his surroundings and mode of life. After a study of the possibilities the necessary changes are gradually instituted. If there is a porch or an available roof to support a balcony the patient is urged to take advantage of the opportunity for sleeping out of doors. If this plan is not feasible the room with the best exposure is selected for the patient and the windows removed. This is not only a wholesome lesson but it admits the greatest possible amount of air and the patient cannot offer innumerable excuses for having the windows down. In Baltimore nearly all houses have shutters which may be closed during a heavy rain.

If the patient has fever he is kept in bed until the temperature becomes normal, although in a few instances, where it was unusually refractory, injections have been begun in spite of a slight daily rise. During the treatment whenever the temperature becomes elevated the patient is again kept in bed until it subsides.

Although the importance of rest is impressed upon each patient, and the necessity of being at rest in the open air during the day as well as at night, it has in most instances been impossible to insist upon absolute quiet. Most of the women under our care have been obliged to assist in home duties and upon many has fallen the whole burden of the household. Some of the men too have worked more or less constantly throughout the whole period of treatment.

As a routine it is required that each patient, especially upon beginning treatment, take two quarts of milk and from two to four eggs a day, although the expense has prevented some from following our directions. In many instances from one to two ounces of olive oil are added, at least until the

normal weight is established. Towards the end of treatment, if the patient has progressed satisfactorily, he is allowed to resume his usual dietary, although a liberal diet is encouraged.

No routine medication has been used during the period of treatment with tuberculin. A tonic of gentian and nux vomica or the elixir of the phosphates of iron, quinine and strychnine was occasionally prescribed in the hope of stimulating appetite, and a few of the patients have taken a little heroin or codein to control excessive cough.

Upon beginning treatment the patients are visited by the nurse every day or every second day, as the circumstances demand. Later, after they are satisfactorily trained, a weekly visit usually suffices, although some are visited oftener and a few particularly reliable patients not so often. Throughout our work the Charity Organization Society has given invaluable aid by supplying food and other necessities to the patients and their families.

The Selection of the Tuberculin.

In the beginning of our work we used old tuberculin. Principally because it was the preparation most generally used, and because we had gained some experience with it in making diagnostic injections. Later we have also used new tuberculin T. R., and more recently the simple unheated filtrate, the B. F., of Denys. We cannot help but feel that more importance has been laid upon the choice of tuberculin than the matter deserves. There is every evidence now for believing that the potency of all tuberculin depends upon the same substance and that all act in just the same way. There is no essential difference between the action of the filtrates and the action of the ground-up bodies of the tubercle bacillus or the action of various extracts of the bacilli. Wolff-Eisner[1] has given evidence to show that even the filtrates depend for their efficacy upon minute portions of the bodies of the bacilli. There is a profusion of writing treating learnedly of the antitoxic action of the filtrates and the antibacterial action of the bacillary emulsions, but there is absolutely no scientific foundation to support such views. Immunity to one kind of tuberculin carries with it immunity to all tuberculins. Nor is there any more sound evidence to lead us to believe that certain extractions rid the preparation of toxic and reaction-producing substances, while the immunizing portion is obtained in a pure condition.[2] What is toxic in tuberculin and causes reactions is the very substance with which we hope to stimulate immunization and a preparation can be made harmless only by ridding it of this substance when it becomes inert. It would seem unnecessary to state that the tubercle bacillus excretes no soluble toxin as the tetanus and diphtheria bacilli do, but in face of the loose ideas that prevail it is a point that deserves emphasis. Of course certain preparations may have advantages which make them more suitable for use from a practical standpoint. For instance it has been said that reactions come more unexpectedly and are more prolonged when bacillary emulsions are used than in treatment with the filtrates. If this be true one might easily explain it upon physical grounds, as it may be difficult to get absolutely uniform suspensions of tubercle bacilli or coarse particles of their ground-up bodies. The claim that the unheated filtrate produces reactions which are more abrupt and less enduring than those following the use of other preparations lacks confirmation.

Following the lead of Spengler a great deal of attention has been paid to the source of tuberculin. This has now narrowed down to interest in the respective tuberculins from human and bovine cultures. Spengler[3] claims that tuberculin from bovine bacilli can be used more satisfactorily in the treatment of infections with the human bacillus and tuberculin from human cultures in bovine infections. As it is now generally granted that two more or less distinct types of the tubercle bacillus exist it may be possible that some slight differences are present which make, under certain conditions, one more easily borne than the other. Upon the assumption of such a difference Detre[4] has devised an ingenious diagnostic method based on the sensitiveness of an infected individual to the two tuberculins as shown in the cutaneous reaction. There is absolutely no analogy between the varying effects of tuberculin from these two sources and the immunization of cattle to bovine infection with human bacilli. Pottenger[5] has offered some striking observations in favor of Spengler's views. His cases are so remarkable that similar results from other observers are to be earnestly desired. A number of our patients who were not taking satisfactorily tuberculin from a human culture were put on bovine tuberculin. No marked difference in tolerance was noted. Indeed there was certainly less difference than in a few cases where a change was made from one form of human tuberculin to another. Two patients who seemed unable to tolerate even small amounts of O. T., when put upon B. F. took without any difficulty increasing doses. This may have been a coincidence; certainly we can offer no satisfactory explanation for it.

Method of Preparing the Dilutions and of Giving the Injections.

Our dilutions are made so that each bottle is one-tenth as strong as the preceding number. Number 1 is the pure tuberculin; number 2, 9 cc. diluent and 1 cc. tuberculin; number 3, 9 cc. diluent and 1 cc. of number 2, etc. The diluent is 0,8 per cent salt solution with 0,25 per cent carbolic acid. This scheme is simple and very convenient, as the number of the bottle represents the number of figures one must write to express the amount of tuberculin in each cc. Thus bottle five contains 0,000,1 gm. tuberculin to each cc., bottle, seven 0,000,001 gm. per cc., etc. The dilutions are

[1] Frühdiagnose und Tuberkulose Immunität. Würzburg, 1909.

[2] Klebs (Virchow's Archiv, 1907, Vol. 190, Beiheft, p. 134) and v. Ruck (Ztschr. f. Tuberkulose, 1906, Vol. VIII, p. 377) have prepared such extracts. They were, too, the basis of the claims made by v. Behring at the International Tuberculosis Congress, Paris, 1905.

[3] Deutsche med. Wchnschr., 1905, Vol. 31, pp. 1228 and 1353.

[4] Wiener klin. Wchnschr., 1908, Vol. XXI, p. 173.

[5] J. Am. M. Ass., 1909, Vol. 52, p. 1007.

made in wide-mouthed, glass-stoppered bottles and are kept in a refrigerator when not in use. The salt solution must be carefully prepared with distilled water and pure sodium chloride. If any impurities are present they may cause endless annoyance by producing a flocculent precipitate which does not become evident until after twelve to twenty-four hours. If the pipettes, bottles and syringes are sterilized there is no danger of contamination. Fresh dilutions are prepared every two weeks. We have been unable to note any change in strength during this period.

Injections are made *subcutaneously* under the skin of the back in the region of the angle of the scapula, varying from right to left. We wish to emphasize subcutaneously because it has been prominently stated [6] that the injections should be made deeply into the muscle. The most delicate guide we have to tuberculin intolerance is the reaction at the site of the injection and it is important that this be where we can see it and feel it. For making the injections we have used syringes devised by the Randel-Faichney Company. These have a narrow bore of 1 cc. capacity divided into hundredths. Of course one cannot measure accurately 0,01 cc., but one can 0,05 cc. Preparatory to injection the skin of the back is cleaned with alcohol. No dressing is applied. In making over 5,000 injections we have never had the slightest infection.

The Principles of Tuberculin Treatment.

Before beginning tuberculin treatment it is important to have clearly in mind just what one purposes to accomplish. With few exceptions the general aim has been to produce a high grade of tolerance to tuberculin. Wright [7] has sought to introduce scientific methods in tuberculin treatment by attempting to measure the effect of each injection and so regulate its size and interval. His studies have led him to advocate small doses and the repetition of the same dose rather than to attempt producing tolerance by increasing doses. Without offering any discussion of Wright's views, it may be pointed out that the results of Moss [8] and the conclusions of the special committee from Oxford and Cambridge Universities [9] throw doubt upon the accuracy of his method; and it may be suggested that the whole of tuberculosis immunity is not contained in phagocytosis. Wright's work has received little support from clinical workers and the older method of producing tuberculin tolerance is the one still in general use. Nearly everyone who uses tuberculin proceeds in a manner a little different from others, but the methods may be conveniently divided into two groups. Those in the first group, whose views are represented by Löwenstein,[10] Roepke and Bandelier,[11] Schlossmann [12] and others, make it their essential aim to reach a high grade of tuberculin tolerance in the shortest possible time. Löwenstein determines the sensitiveness to tuberculin by diagnostic injections and then begins with the dose, or a slightly smaller dose, than the one liberating a reaction and rapidly increases the amount. The essential points about his method are to avoid giving small doses, and after once beginning treatment never to retreat to smaller amounts. If a patient gives a severe reaction repeat the dose until there is no longer a reaction, and if a mild reaction occurs, the dose may still be increased. It is claimed that by giving small doses and particularly by giving small doses repeatedly such a high grade of hypersensitiveness is developed that it becomes impossible to proceed with any degree of satisfaction to large amounts of tuberculin. Schlossmann, working among infants, begins with a dose that causes a reaction and then ascends with almost incredible rapidity to large amounts. In a child 12 months old he began with 0,000,1 gm. old tuberculin and in 60 days repeated this dose 30 times, producing 28 reactions. Another child 10 months old received 0,000,1 gm. twice, then 0,001 gm. eight times; after the sixth injection, no longer a reaction. Then 0,002,5 gm. once and 0,005 gm. five times, 0,01 gm. three times, 0,05 gm. five times; after the fifth injection no longer a reaction. Then 0,1 gm. three times and 0,5 gm. four times. After a month's pause the child showed a definite reaction to 0,1 gm. This dose was repeated three times, then 0,2 gm. once, then 1 gm. five times, after which there was no longer a reaction. Then 2 gm. five times. Later the child received 5, 10 and even 20 gm. Apparently the injections were made every second day. In another instance he advanced from 0,001 gm. to 2 gm. in three weeks.

Bandelier and Roepke occupy a position between the two groups. Perhaps it might be better to classify them in the second. They urge the repetition of the same dose after mild reactions and encourage a retreat after severe reactions. However, they begin with doses much higher than those used in the mild method and do not urge the same extreme caution in avoiding even slight reactions.

The second group is represented notably by Trudeau,[13] Denys [14] and Sahli.[15] While they aim to produce as high a grade of tuberculin tolerance as possible, the reaching of high doses is not their ultimate object. They believe that treatment should be begun with a dose so small that no reaction will be produced and the dose steadily advanced, but so slowly and so cautiously that no reaction will occur. The essential feature of this method, then, is to avoid the occurrence of any reaction, even mild ones, and to carry the individual patient only as high as his tolerance will permit, and rather to suspend treatment than to force him beyond this measure. The greatest care is exercised to discover the

[6] Bonney: Pulmonary Tuberculosis, etc. W. B. Saunders Co., 1908.

[7] Lancet, Lond., 1905, Pt. II, p. 1598.

[8] Johns Hopkins Hosp. Bull., 1907, Vol. 18, p. 237.

[9] A Report of the Committee for the Study of Special Diseases from Oxford and Cambridge Universities.

[10] Handbuch der Technik u. Methodik d. Immunitätsforschung. Kraus u. Levaditi, Vol. I, p. 821.

[11] Lehrbuch der Specifischen Diagnostik u. Therapie der Tuberkulose. Würzburg, 1908.

[12] Deutsche med. Wchnschr., 1909, Vol. 35, p. 289.

[13] Am. J. M. Sc., 1906, Vol. 132, p. 175.

[14] Le Bouillon Filtré. Louvain, 1905.

[15] Ueber Tuberkulin Behandlung. Basel, 1907.

earliest symptoms of susceptibility, and when they occur the dose is either reduced or carried along at the same level until they disappear.

There are many questions which are brought up for consideration by these two methods, but notably the question of hypersensitiveness and of the advisability of producing reactions.

As is well known, patients with tuberculosis, except under special conditions, have a marked sensitiveness to tuberculin, and this sensitiveness is the basis of all of the specific methods of diagnosis. The reaction is not due to tuberculin itself, for tuberculin is absolutely non-toxic in non-infected individuals. This is demonstrated by the very large amounts that may be given healthy infants with impunity.[16] The hypersensitiveness to tuberculin is different too from the hypersensitiveness developed after an injection of albumen, inasmuch as no number of repeated tuberculin injections will produce hypersensitiveness in a non-infected animal. Indeed it would seem that hypersensitiveness to tuberculin occurs only when living organisms have grown in the animal body.[17] Tuberculin itself is, then, not a toxic substance, and a reaction following its introduction into the body must be due to some newly-formed toxin. Marmorek[18] supposes that it stimulates the tubercle bacilli to produce their real toxin, which is quite different from tuberculin itself. The local phenomena at the point of application is a strong argument against such a view. It is more commonly considered that the tuberculin itself is split up by antibodies which act as ferments (v. Pirquet,[19] Vaughn[20]) or as lysins (Wolff-Eisner[21]), and that in the process of disintegration the toxic substance is liberated. It is to this newly-formed toxin that the cells become hypersensitive. The whole phenomenon of hypersensitiveness no doubt represents a protective reaction of the body. The remarkable local phenomena following the application of tuberculin to any part of the body of a tuberculous patient illustrates how alive the cells have become to a protective response. Animals with tuberculosis, as Roemer[22] has so beautifully shown, possess a very remarkable grade of immunity to renewed infection, but they cannot successfully combat the disease that has once become established.

While this hypersensitiveness is a protective reaction it is also the cause of the fever and general constitutional symptoms which accompany tuberculous infection.

There may be two indications for tuberculin treatment. Certain isolated foci of disease may be cut off from the general circulation and so little of the specific material be absorbed that no defence reaction is produced by the body. It seems reasonable to assume that the healing of such foci may be hastened by artificially stimulating this reaction. Here hypersensitiveness would be a valuable asset. Such a condition, however, would exist but rarely in pulmonary lesions. Far more commonly, there is too much absorption and the symptoms of such absorption are manifest. It is in the hope of combating these symptoms that tuberculin is given. As the tolerance for tuberculin increases, the body loses its susceptibility as well to the toxin absorbed from the disease in the lungs. Nothing is more striking in tuberculin treatment, when increasing doses are tolerated, than the great improvement in the symptoms usually spoken of as toxic. What we aim to accomplish is to render the body insensitive to the influence of the toxins absorbed so that it may be vigorous and in health, in spite of the existence of the tuberculous focus. We then hope that it will be in better condition to bring about healing of the lesion. This is certainly what practical experience would induce us to believe. Under tuberculin treatment symptoms frequently disappear and nutrition improves in a remarkable manner. It is a long time before there is a noticeable change in the character of the lesion. Of course, tuberculin does more than influence the phenomenon of hypersensitiveness. If we are to believe Wright, phagocytosis is increased. The agglutinating power of the serum is certainly raised. These processes may be of the greatest importance in destroying the tubercle bacillus and in inducing healing of the lesion.

This process of immunization is an active one. Tuberculin itself is not a curative agent. It is useful only in stimulating a response from the body, and if the body cannot respond, it does no good and may even be harmful. The mechanism by which tolerance for tuberculin is acquired we cannot satisfactorily explain. It is probable that the body cells themselves do not become insensitive.* Wasserman,[23] by complement absorption experiments, thought he could demonstrate antituberculin in the blood of treated patients. While it is certain that this substance is not an antitoxin in the same sense that animals treated with diphtheria toxin produce an antitoxin, it is possible that the toxic portion split off by the disintegration of tuberculin may find a binding substance in the blood. Wolff-Eisner[24] suggests that certain tissues and organs may develop receptors which hold the tuberculin or the split-off toxin and prevent it reaching important organs.

Hypersensitiveness to tuberculin may be stimulated artificially by the repeated injection of small amounts of tuberculin and notably by producing a reaction to tuberculin. Löwenstein[25] was the first to lay stress on its importance in diagnostic injections. We[26] have shown in numerous charts how the fifth of a milligram, which on the first administration produced no appreciable change, may give rise to an

[16] Hamburger: München. med. Wchnschr., 1908, Vol. LV, p. 1220.

[17] Baldwin (Yale M. J., Feb., 1909) gives a good review of this subject. He suggests that hypersensitiveness to tuberculin differs in degree but not in kind from that to other albumens.

[18] Arch. gén. de méd., 1903, Vol. 192, p. 2945.

[19] Wiener med. Wchnschr., 1907, No. 28.

[20] J. Infect. Dis., 1907, Vol. IV, p. 476.

[21] Loc. cit.

[22] Beiträge z. Klinik d. Tuberkulose, 1908, Vol. XI, p. 79.

* At least they do not in diphtheria toxin immunization, as Behring has shown in his paradoxical reaction.

[23] Deutsche med. Wchnschr., 1906, Vol. XXXII, p. 449.

[24] Loc. cit.

[25] Ztschr. f. Tuberkulose, 1904, Vol. 5, p. 485.

[26] Hamman: Archiv. Internal Med., June, 1908.

intense reaction after the second, third, fourth or fifth injection. Koch, himself, has formulated it as an essential principle in tuberculin diagnosis that when a given dose has produced a reaction ever so slight, this same dose should be repeated before ascending to larger amounts. Such a repetition is almost constantly followed by a severe reaction. After frequent repetitions the reaction may become milder and milder, and finally fail to appear. However, Schlossmann, as previously quoted, obtained 28 successive reactions following the administration of the same dose. We have never had the courage to make such repeated injections, but Charts Nos. 1 and 2 illustrate how each of the successive reactions to the same dose becomes more severe than the previous one. We know that Löwenstein and Bandelier and Roepke show charts where a reaction does not occur when the same dose is repeated and then rapidly raised. We have had such instances too, but in our experience they are distinctly the exception. When during treatment reactions occur, especially to high doses, one has practically always come to the point where the dose must be decreased, or if the patient is to be forced onward, it must be done at the expense of entailing at least several, and often many severe reactions. This brings us to a consideration of the value or harmfulness of tuberculin reactions.

It will be remembered that the reaction was an important part of the immunizing process first outlined by Koch in tuberculin treatment, and even in later publications he has never completely relinquished the idea of its importance. However, it was this feature that largely contributed to bringing the treatment into discredit. With the experience of this early tuberculin era before us it seems incredible that Schlossmann's methods could gain general acceptance. To all appearances his cases showed marked and unusual improvement, but it is hardly possible that such a procedure could be of general applicability, especially in pulmonary tuberculosis. It is indeed more than likely that even after small doses which cause no appreciable effects, mild focal reactions occur. These may be observed when the tuberculous lesion is situated externally. That such mild reactions may be beneficial is not unreasonable. The increased blood-flow and slight inflammatory reaction may bring the processes of immunization to act more satisfactorily upon the lesion. These mild reactions are, however, not those to which reference is made. It is the severe reactions, and particularly the prolonged and repeated reactions, to which we have reference.

Our own experience has unquestionably influenced us strongly to look upon these as undesirable. While it is true that some patients progress favorably in spite of numerous reactions, many suffer appreciably in their general condition. Most observers agree, too, that profound focal reactions are, to say the least, not advantageous. Such marked increase in the area of physical signs as exhibited by the patient from whose records Chart No. 2 is constructed cannot be interpreted as indicating an active advancement of the disease. We know how insufficient our methods of examination are, and how far short they fall of giving us a true picture of the extent of the pulmonary lesion. Without question this patient had disseminated tubercles throughout the right lung before the reactions occurred. The râles developed merely as an expression of the inflammatory reaction about these tubercles. Is such a reaction desirable? We appreciate that this question is not one to be answered off-hand. But the marked depreciation in the general health of these patients, their slow and tedious recovery and the obstinate persistence of the physical signs have impressed us as decidedly unfavorable. We have never had the courage to force such patients to higher doses in spite of the repeated reactions. It certainly cannot be said that by using small doses and avoiding all reactions it is impossible to carry patients to a high grade of tuberculin tolerance. The method is longer and more tedious than Löwenstein's apparently is, but the object is frequently attained just as surely and certainly more smoothly.

The Method of Producing Tuberculin Tolerance.

Our experience then has forced us to adopt the mild method of inducing tuberculin tolerance. While each patient must be studied individually and his susceptibility be made the guide of the size and increase in dose, we have developed a plan to which we more or less closely adhere. The first requisite for a successful management of cases is to have a wholesome respect for even the smallest doses of tuberculin. In the beginning of our work we made 0,000,001 gm. the initial dose, but as many patients showed reactions in the thousandths of a milligram, it was later reduced to 0,000,000,1 gm. and even to 0,000,000,01 gm. We are now, however, beginning to individualize. Patients in good general condition with an inactive lesion may be started at 0,000,001 gm., while those with symptoms of absorption from the tuberculous area are started on smaller doses. Remembering that the whole process of tuberculin treatment depends for success on an active response of the infected body, we have sought to bring the patients to as satisfactory a condition of general health as possible before beginning injections. When there is fever or the patients' general nutrition has suffered, they are put to bed until there is sufficient improvement. Indeed, three or four weeks in bed is an excellent preparation for any patient beginning tuberculin treatment. During this time, too, they became acquainted with proper record-keeping. After a start has once been made an increase in dose will depend upon how the preceding one has been borne. In the small doses each succeeding one may be doubled, but when we reach the thousandths and hundredths of a milligram advancement should be more cautious. In these larger doses we in the beginning increased by decimals; thus, 0,000,01, gm., then 0,000,02 gm., then 0,000,03 gm., etc. At a glance it is seen how irregular such a scheme is. From one to two is doubling the dose, from 9 to 10 is only a one-ninth increase. It was noted too that most reactions occurred in the first decimals, where the jumps are largest. To obviate this inconsistency one may insert an extra dose between one and two and between two and three, and at the end of the scale jump from five to seven and from seven to ten. This plan

has long been in use by Brown, of Saranac (N. Y.), and more recently he has devised logarithmic tables which allow a regular increase in the dose. They give the method greater accuracy but are a little cumbersome; and as a patient's response can by no means be measured mathematically, the simpler plan, cautiously used, is satisfactory. In the smaller doses we have given injections twice a week; after ten milligrams is reached, only once a week.

As the all-important feature of the method of tuberculin treatment here outlined is the avoidance of reactions, it is essential to consider the signs of developing intolerance. A reaction to tuberculin consists of four essential features: a rise of temperature, constitutional symptoms, a local reaction at the site of injection and a focal reaction. In a typical reaction all four are present but each may occur in the absence of the others and in any combination of two or three out of the four. Without question the most delicate and the most constant sign of approaching intolerance is the local reaction.

The local reaction consists of swelling and redness at the site of injection. The patient usually complains of pain and tenderness. A little tenderness when leaning against the point is the most common complaint. It is, however, a matter of the greatest importance that a considerable local reaction may occur without the patient making any complaint or even when denying its presence when questioned. An injection should never be given without first making a careful examination of the point of previous injection. When there has been a reaction a definite nodule of infiltration can usually be felt, but when the reaction is slight it may be necessary to pick up folds of skin on corresponding portions of the body before the infiltration can be appreciated. We have the impression that exceptionally a febrile reaction may occur in the absence of a local reaction; but in the last eight months, during which time we have paid especial attention to the association, we have seen no general reaction which was not preceded by a local reaction after a previous injection. We are indebted to Denys for calling our attention to this point so forcibly. Chart No. 3 is a good illustration of it.

Constitutional symptoms also frequently occur before a febrile rise. The patient must, however, be carefully questioned to elicit these. They are seldom striking. A feeling of lassitude and slight general malaise, loss of the usual bodily vigor, mental depression, restlessness, digestive disturbances and notably a continuous loss of weight may all be indicative of intolerance. These symptoms are tabulated in the record books and the patient cautioned to observe them carefully. It is indeed frequently difficult, in a nervous patient, to determine whether certain ill-defined symptoms depend upon tuberculin. As one learns the disposition and character of a patient, however, one soon comes to a correct estimate of his complaints. We have never seen a neurotic, introspective patient depressed or harmed by record-keeping. It seems indeed to give them a diverting occupation and to offer a support against their vacillation.

A reaction at the site of the lesion may be manifested by symptoms or by signs. Pain in the chest, dyspnea and increased cough and expectoration are the characteristic symptoms. These may occur independently of any relation to tuberculin, but their presence demands caution. Much less commonly there is an increase in the number or extent of the râles. Any marked change in the physical signs we have never observed except following an outspoken febrile and constitutional reaction.

Experience has taught us that with careful observation of the point of injection and of the patient's symptoms, febrile reactions rarely occur. It is, however, of importance that the slightest elevation of temperature—one of even a few fifths—should receive careful consideration. As we have previously stated, if these go unobserved, the following injection will almost certainly liberate a more intense reaction. (See Charts Nos. 1, 2, 3, 4, 5, 6 and 7.) It is at times a question of the greatest difficulty to decide if tuberculin is responsible for a particular temperature elevation. We know how common it is for patients with pulmonary tuberculosis to have temporary flare-ups of fever when they are not being treated with tuberculin. Such elevations may have all the characters of a tuberculin reaction artificially produced, and indeed are essentially the same thing. Intercurrent infections too must be considered. The latter group are as a rule easily distinguished. Charts Nos. 8 and 9 show the fever from tonsilitis; Chart No. 10 from grip; Chart No. 11 from syphilis. No definite decision can be made in some instances belonging to the first group. Denys refuses to consider any temperature elevation as due to tuberculin which comes on more than 48 hours after the injection. It is characteristic of tuberculin reactions that the rise is abrupt even though the fall may be irregular and prolonged. A fever coming on with step-like progression, so that the fastigium is not reached until the third or fourth day, is unlikely to be due to the tuberculin injection. We have become so impressed with the almost constant appearance of a local reaction to injections preceding the ones liberating a general reaction that we would hesitate to ascribe an elevation coming suddenly in the midst of a perfectly smooth tuberculin treatment and unaccompanied by a local reaction, to the injections, provided, of course, that the dose has not been unduly increased. Charts Nos. 12 and 13 show such questionable febrile reactions.

Being acquainted with the symptoms and signs of tuberculin intolerance, what should be our behavior when they arise? When there has been a slight febrile reaction to a small dose unaccompanied by marked constitutional symptoms, it often happens that when the dose is repeated once or several times no further reaction occurs and we can then rapidly ascend. This is particularly true of the small doses given at the beginning of the cure. Charts Nos. 14, 15 and 16 illustrate this. However, it does not always succeed, as Charts Nos. 17 and 18 show. When we have reached larger doses this method is seldom practicable. Charts Nos. 1 and 2 show how the sensitiveness is not only maintained but even increased.

After a moderately severe or a severe reaction we should allow from ten to fourteen days to elapse after all symptoms

of the reaction have subsided and then begin with much smaller doses. Since we have given special attention to the site of injection such reactions have been exceedingly rare. If a local reaction follows an injection the same dose is repeated. This repetition is continued until no local reaction occurs before going to higher doses. If the local reaction becomes more severe to subsequent injections, or if a mild febrile reaction follows, the dose is decreased and then again cautiously raised. By this method we frequently come to a point beyond which it seems impossible to carry the patient and it is here that the greatest demand is made upon our patience and perseverance. Chart No. 19 shows such a condition and here is a case that illustrates the point:

Dispensary No. 2162. Mamie F., white female, age 19, single. Onset of illness in August, 1907. Was run down and during a vacation "caught cold." Had cough, weakness and loss of appetite. Came to Dispensary November 9, 1907, complaining of severe cough and weakness. Family history negative and no history of exposure. Had lost 9 pounds.

Examination.—Temperature 100° F., pulse 130, respiration 22, weight 109 lbs. Pale, frail girl; eyes sunken; poorly nourished.

Lungs.—Right: Note impaired to third rib and behind to angle of scapula; breath sounds diminished in intensity with tubular quality above and below clavicle and in supraspinous fossa. Moist râles on quiet breathing to second rib; after coughing to fourth rib, and behind to angle of scapula. Left: Note impaired less markedly than on right above and below clavicle and in supraspinous fossa; more marked dullness at extreme base behind. Breath sounds harsh at apex and at base. Few fine moist râles above and below clavicle and at base behind. Mucopurulent sputum with tubercle bacilli.

On January 3, 1908, O. T. begun with injection of 0,000,000,1 gm. Dose was gradually raised and several slight reactions occurred in the hundredths of a milligram, necessitating a return to 0,000,005 gm. on June 26, 1908. Dose again raised until, on October 13, she received 0,000,4 gm.

1908

Oct. 20. O.T. 0,000,5 gm.; no fever; no local pain or swelling; no constitutional symptoms.
23. O.T. 0,000,6 " no fever; no local pain or swelling; no constitutional symptoms.
27. O.T. 0,000,8 " no fever; marked local swelling although patient made no complaint of it; no constitutional symptoms.
30. O.T. 0,001 " temperature to 101.6° F.; some cough and general malaise; no local swelling.

Nov. 13. O.T. 0,000,1 " no fever; no local pain or swelling; no constitutional symptoms.
17. O.T. 0,000,2 " no fever; no local pain or swelling; no constitutional symptoms.
20. O.T. 0,000,3 " no fever; no local pain or swelling; no constitutional symptoms.
27. O.T. 0,000,4 " no fever; no local pain or swelling; no constitutional symptoms.

Dec. 1. O.T. 0,000,5 " no fever; no local pain or swelling; no constitutional symptoms.
4. O.T. 0,000,6 " no fever; marked local pain and swelling; no constitutional symptoms.
8. O.T. 0,000,8 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
11. O.T. 0,000,8 gm.; no fever; some local tenderness; no constitutional symptoms.
15. O.T. 0,000,8 " no fever; no local pain or swelling; no constitutional symptoms.
22. O.T. 0,000,8 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
29. O.T. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.

1909

Jan. 5. O.T. 0,002 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
8. O.T. 0,002 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
12. O.T. 0,002 " temperature to 99° F.; marked local swelling and redness; no constitutional symptoms.
15. O.T. 0,001 " temperature to 99° F.; slight local swelling and redness; no constitutional symptoms.
19. O.T. 0,001 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
22. O.T. 0,001 " caught a "cold"; temperature on 25th 99.4° F.

Feb. 2. O.T. 0,001 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
5. O.T. 0,001 " temperature to 99° F.; moderate local swelling; indigestion.
9. O.T. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.
12. O.T. 0,001,5 " temperature to 99.4° F.; no local pain or swelling; no constitutional symptoms.
23. O.T. 0,001 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.

Mar. 1. O.T. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.
5. O.T. 0,001,5 " temperature to 99.2° F.; no local pain or swelling; no constitutional symptoms.
9. O.T. 0,001,5 " no fever; no local pain or swelling; no constitutional symptoms.
12. O.T. 0,002 " temperature to 99.4° F.; no local pain or swelling; no constitutional symptoms.
19. O.T. 0,002 " temperature to 99.4° F.; no local pain or swelling; no constitutional symptoms.
23. O.T. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.
26. O.T. 0,001,5 " no fever; swelling at site of injection and of previous injection; no constitutional symptoms.
30. O.T. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.

April 2. O.T. 0,001,5 " temperature to 99.2° F.; some local swelling; no constitutional symptoms.
6. O.T. 0,001 " temperature to 99.8° F.; no local pain or swelling; no constitutional symptoms.

From beginning of treatment to February 12, 1909, patient gained 17 lbs; but during period of hypersensitiveness, with many slight reactions, she lost 4¾ lbs. Patient's general condition has greatly improved, and nearly all the symptoms have subsided. Sputum on June 9, 1908, was negative, and she has had no sputum since then. Râles have disappeared on the left side, and are less numerous and not so extensive on the right.

By selecting a dose just short of the one to which the patient reacts and repeating this dose indefinitely, or by returning to a smaller dose and gradually increasing, we are usually able to overcome this hypersensitiveness.

The following case is illustrative:

Dispensary No. 3127. Maud R., white female, age 28, single. Has had cough, always worse in winter, for three years. Two years ago had four or five hemoptyses; maternal grandmother and one brother and one sister have died of pulmonary tuberculosis. Patient lived at home while brother and sister were sick. Came to dispensary July 21, 1908, complaining of cough and expectoration.

Examination.—Temperature 98.8° F., pulse 92, respiration 16, weight 115¼ lbs. Fairly well nourished, good color, does not look ill.

Lungs.—Right: Note impaired above and below clavicle and behind to fourth dorsal spine; breath sounds above clavicle tubular, below harsh and interrupted, in supraspinous fossa rather suppressed with tubular quality; after cough a few moist râles above and below clavicle. Left: Note a little impaired above clavicle and in supraspinous fossa; breath sounds rather harsh; few fine râles above clavicle after cough. Cutaneous and conjunctival reactions positive. No tubercle bacilli found in sputum.

Tuberculin treatment begun August 18, 1908, with 0,000,000,1 gm. bouillon filtrate. Dose was then uneventfully raised until October 27, 1908.

1908			
Oct.	27.	B.F. 0,000,004 gm.	temperature to 99° F.; marked local swelling; no constitutional symptoms.
Nov.	6.	B.F. 0,000,001 "	temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
	10.	B.F. 0,000,001 "	no fever; no local pain or swelling; no constitutional symptoms.
	13.	B.F. 0,000,002 "	no fever; no local pain or swelling; no constitutional symptoms.
	17.	B.F. 0,000,003 "	no fever; no local pain or swelling; no constitutional symptoms.
	20.	B.F. 0,000,004 "	no fever; no local pain or swelling; no constitutional symptoms.
	24.	B.F. 0,000,005 "	no fever; no local pain or swelling; no constitutional symptoms.
	27.	B.F. 0,000,006 "	no fever; no local pain or swelling; no constitutional symptoms.
Dec.	1.	B.F. 0,000,008 "	no fever; no local pain or swelling; no constitutional symptoms.
	4.	B.F. 0,000,01 "	no fever; no local pain or swelling; no constitutional symptoms.
	8.	B.F. 0,000,015 "	no fever; no local pain or swelling; no constitutional symptoms.
	11.	B.F. 0,000,02 "	no fever; some local soreness and swelling; no constitutional symptoms.
	15.	B.F. 0,000,02 "	no fever; slight local soreness; no constitutional symptoms.
	18.	B.F. 0,000,02 gm.	no fever; no local pain or swelling; no constitutional symptoms.
	22.	B.F. 0,000,03 "	no fever; no local pain or swelling; increased cough.
	29.	B.F. 0,000,04 "	temperature to 99° F.; slight local soreness; no constitutional symptoms.
1909			
Jan.	2.	B.F. 0,000,04 "	temperature to 99° F.; no local pain or swelling; "biliousness."
	5.	B.F. 0,000,05 "	temperature to 99° F.; slight soreness and swelling; no constitutional symptoms.
	8.	B.F. 0,000,05 "	no fever; slight local pain; no constitutional symptoms.
	12.	B.F. 0,000,07 "	no fever; marked local pain and swelling; no constitutional symptoms.
	15.	B.F. 0,000,06 "	temperature to 99° F.; slight local pain; no constitutional symptoms.
	19.	B.F. 0,000,05 "	temperature to 99.8° F.; no local pain or swelling; no constitutional symptoms.
	22.	B.F. 0,000,05 "	temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
	26.	B.F. 0,000,07 "	no fever; local pain and swelling; no constitutional symptoms.
	29.	B.F. 0,000,07 "	temperature to 99° F.; local pain and swelling; no constitutional symptoms.
Feb.	2.	B.F. 0,000,06 "	temperature to 98.8° F.; local pain and swelling; no constitutional symptoms.
	5.	B.F. 0,000,06 "	no fever; slight local pain; no constitutional symptoms.
	9.	B.F. 0,000,07 "	no fever; no local pain or swelling; no constitutional symptoms.
	12.	B.F. 0,000,08 "	temperature to 99.4° F.; local pain and swelling; headache and general malaise.
	23.	B.F. 0,000,01 "	no fever; no local pain or swelling; no constitutional symptoms.
	26.	B.F. 0,000,02 "	no fever; no local pain or swelling; no constitutional symptoms.
Mar.	2.	B.F. 0,000,03 "	no fever; no local pain or swelling; no constitutional symptoms.
	5.	B.F. 0,000,04 "	no fever; no local pain or swelling; no constitutional symptoms.
	9.	B.F. 0,000,05 "	temperature to 98.8° F.; slight local pain and swelling; no constitutional symptoms.
	12.	B.F. 0,000,05 "	no fever; no local pain or swelling; no constitutional symptoms.
	23.	B.F. 0,000,07 "	no fever; no local pain or swelling; no constitutional symptoms.
	26.	B.F. 0,000,09 "	temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
	30.	B.F. 0,000,1 "	no fever; no local pain or swelling; no constitutional symptoms.
April	2.	B.F. 0,000,2 "	temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
	6.	B.F. 0,000,4 "	no fever; no local pain or swelling; no constitutional symptoms.

13. B.F. 0,000,7 gm.; no fever; no local pain or swelling; no constitutional symptoms.
16. B.F. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.

Patient's general condition has improved very much. She now has no symptoms and has gained 26½ lbs. The râles have disappeared.

Here is the essential difference between the mild and the more abrupt methods of tuberculin administration. When we have reached the height of the patient's tolerance we quietly wait rather than force them on to higher doses through repeated reactions. And the question may be put if we are not accomplishing all that tuberculin can do by thus remaining just below the reacting-point? Certainly there is no clinical evidence to show that these patients do not progress as satisfactorily as those going uninterruptedly to the highest doses. Their general condition continues to improve, or at least remains stationary, and there is no aggravation of the physical signs, which is more than we can say of some of the patients whom we tried to force on in spite of reactions. It is important too to emphasize not only that intercurrent infections call for interruption of tuberculin treatment but that they also heighten sensitiveness. It is not enough to allow time for complete recovery before again beginning treatment, but the treatment should be taken up at a much lower dose.

With the method as here outlined it is often possible to carry patients without a break in the plan to very high doses. The point that we should aim to reach is empirical, but we have never gone beyond one gram. Having reached this dose we have in some patients repeated it over months, at intervals of one or two weeks. We have made no particular point, however, about reaching this amount. We have stopped at the dose where reactions threatened further advance. After even a year of treatment some patients have not been over 0,1 gm. and many even lower than this. Occasionally one will find it impossible to get beyond the smallest amounts, in spite of every effort. One patient during ten months of treatment never received over 0,000,009 gm., and another during thirteen months never over 0,000,009 gm. While occasionally a marked improvement will occur under even these small doses repeatedly given, as a rule patients showing such unusual hypersensitiveness fail to respond with the usual amelioration of symptoms and improvement in the nutrition.

Tuberculin tolerance or immunity must not be confounded with tuberculosis immunity. Not only is it possible for the original lesion to spread while the patient's general condition improves under tuberculin treatment, but even when large doses are tolerated the disease may break out in other organs. One of our patients developed tuberculous laryngitis after doses of twenty and thirty milligrams had been successfully reached.

An unpleasant experience leads us to give one important caution. As it is impossible to satisfactorily standardize tuberculin, the same product from different laboratories varies in strength and indeed the same product from the same laboratory may vary in preparations made at different times. If during treatment it becomes necessary to change from the tuberculin of one culture to that of another the greatest caution should be observed in the first few injections to test the patient's tolerance. In the instance to which we refer, a patient was receiving 400 mg. of B. F. when it became necessary to use the B. F. of another laboratory. The patient was given 400 mg. of the product and a very violent reaction ensued.

Cases Suitable for Tuberculin Treatment.

The most satisfactory results from tuberculin are attained among early cases. It must be admitted that early cases respond best to any form of treatment, and in them the value of tuberculin can be determined only by the durability of the results. The most striking improvement is seen in certain moderately and far advanced cases who, under general hygienic-dietetic treatment, have experienced some amelioration of their symptoms, but who have then for months remained stationary. The following case is an instance:

Harry T., white male, age 32, single, brass polisher and plater. Came to dispensary September 4, 1906, complaining of bronchial trouble. Illness began fourteen months before with a "cold." Had fever and night sweats, but was not ill enough to be confined to bed. Ever since then he has been coughing, and has grown weaker. He has lost about six or seven pounds in weight. Has been constantly under treatment and unable to work during this time.

One sister died of tuberculosis when patient was eleven years old and he was intimately associated with her.

Examination.—Temperature 98° F., pulse 70, respiration 26, weight 129¾ pounds. Fairly well nourished, but looks pale and ill. Scars on left side of neck from glands which broke down five years ago. Marked limitation of movement of whole left side.

Lungs.—Right: Note a little impaired above clavicle and in supraspinous fossa; inspiration harsh and expiration a little blowing; no râles. Left: Note impaired down to second rib, and to angle of scapula behind. Breath sounds diminished in intensity over the whole side; tubular quality above and below clavicle and in interscapular area. Numerous fine and medium moist bubbling râles over nearly the whole side, and a few sibilant and sonorous râles. Numerous fine superficial crackling râles throughout the axillary region; only a small number of râles below the angle of scapula.

Heart and Abdomen.—Nothing remarkable.

From September to February patient came regularly to dispensary and apparently followed directions, but there was no special improvement in his condition. He was still sallow and ill-looking. Was still coughing and had gained but a few pounds in weight. On February 8 tuberculin treatment was begun with 0,000,001 gm. O. T. After a few weeks, patient began to show a great improvement in his general appearance and his cough too began to improve.

When treatment was stopped on June 26, 1908, patient weighed 171 pounds, and was a picture of robust health.

On admittance sputum examination was negative. Tubercle bacilli were found on May 3, 1907. Two later examinations were again negative, and since May, 1908, he has had no sputum to bring for examination.

The physical signs exhibited changes which might be interpreted as indicating beginning fibrosis. The râles grew progressively less moist and bubbling in character. After having been

away from work for over three years the patient returned to his previous occupation of brass plating. He has now been steadily at work for eight months and has had no return of symptoms. His weight has gradually dropped to 156 pounds, a loss that was to be expected after taking up active employment.

It is futile to expect patients with rapidly progressing disease and marked constitutional symptoms to react favorably to tuberculin. The patient must be offering some resistance to his disease before we can hope that tuberculin will stimulate such resistance. Fever of a mild grade, when other conditions are favorable, need not be a contraindication to treatment. Indeed a slight continuous fever may satisfactorily subside after injections of small doses. Where tuberculin is particularly indicated is in the early stages of pulmonary disease and in those patients in good or fair general condition with sluggish, moderately or far advanced lesions. The latter group comprises those patients who will show the most brilliant results.

Results of Treatment.

The total number of patients that received the tuberculin treatment is 112. But this report deals only with those who were under treatment at least 90 days—a group of 71 cases. These 71 cases have been analyzed in Table I, and classified according to condition on admission, conformably to the nomenclature of the National Association for the Study and Prevention of Tuberculosis.[27] However, only 57 of the cases lend themselves to this classification, the remaining 14, which we label "probable," being patients in whom the diagnosis of pulmonary tuberculosis cannot be made with assurance, although they present very suggestive signs and symptoms. These 14 probable cases were treated in every way as if they were positively tuberculous, and we are gratified to report that whatever may have been the cause of their symptoms and signs, they all improved as regards these symptoms, and in a fair number, the suggestive physical signs, too, vanished. While the remainder of the report deals mainly with the 57 cases which we regard as definitely tuberculous, yet data concerning the 14 "probable" cases will often appear.

The classification on discharge conforms strictly to the definitions established by the National Association. It is well to recall, here, that the class marked "progressive" (worse), on discharge, therefore includes not only those patients who were actually worse, but those too who had not changed, and also those in whom the physical signs alone had not changed, although there was manifest and even marked improvement in the symptoms.

Table II presents the results of treatment in the classes grouped according to condition on admission, and further subdivided according to the presence or absence of tubercle bacilli in the sputum. The 57 cases comprise 13 incipients, 16 moderately advanced, 28 far advanced, of which 4 incipients, 6 moderately advanced, 25 far advanced, a total of 35, show tubercle bacilli in the sputum. On account of the difficulty we experienced in making sufficiently numerous sputum examinations in our large ambulant clinic, the number of negative cases is largely due rather to our negligence than to the absence of bacilli.

Of the 57 cases, 10 were apparently cured, 16 were arrested, 12 were improved, 18 were progressive, 1 died (a far advanced case).

Of the 18 progressive cases, 4 improved as regards symptoms, 10 were unchanged as regards symptoms, and only 4 were worse as regards symptoms (all 4, far advanced cases).

Of the 13 incipients, only 1 was progressive; of the 16 moderately advanced 2 were progressive; of the 28 far advanced 16 were progressive (1 died).

Table III shows the average gain in weight on the basis of condition on admission and at discharge. As was to be expected, the moderately advanced cases—those that have lost a considerable amount of weight, and yet are not too far advanced to improve—show the largest increase. On the basis of results, note the wide gap between the progressive cases and all the rest. The average gain in weight for the entire group is 6½ pounds. The maximum gain in weight is 41 pounds (Case 2 in Table I—a far advanced case). Among those that lost weight are three apparently cured cases.

Table IV shows the average maximum dose of tuberculin per class. For the entire group it is 0,005 gm. It is seen that the early cases and those that do well take the largest dose. The largest dose that we have ever administered is 1.0 gm. This was attained by Cases 7 and 46. In this connection we present a compilation based on the figures given by L. Brown in the Twenty-fourth Annual Report of the Adirondack Cottage Sanitarium. It is remarkable that his apparently cured cases have attained such a low maximum dose.

Table V shows the average number of days and doses required to attain the maximum dose. It seems that the far advanced and progressive cases reach their limit of tolerance early. That is, they soon attain a dose beyond which it is impossible to force them without unpleasant consequences. That this early attainment of the maximum dose is not due simply to a briefer total period of treatment is seen from Table VI, which presents the average duration of treatment in days, and the average total number of doses. This table suggests that the duration of treatment is based rather on the progress of the case than on its condition at the beginning of treatment.

Table VII shows the average number of days intervening between two successive doses. This period seems to be much alike in all the cases and suggests that our prudence consisted rather in the regulation of the dose than on its occasional omission.

Table VIII gives the average number of reactions during the entire period of treatment, and Table IX shows after how many doses and after how many days a reaction may be expected in the various classes. Those two tables agree in showing that the number of reactions depends rather on the condition when admitted than on the result of treatment, and furthermore that the far advanced cases show the greatest number of reactions.

[27] L. Brown: J. Am. M. Ass., 1909, Vol. LII. p. 241.

TABLE I.

Prepared in accordance with the suggestions of the National Association for the Study and Prevention of Tuberculosis.

No. Sex Age	Condition		Extent of Physical Signs (Turban)		Duration of Disease	General Condition	Digestion	Weight		Range of Pulse 7 days on Admission 2 days on Discharge	Av. Max. Temp. 7 days on Admission 2 days on Discharge	T. B.			Complications	Tuberculin Variety, No. of Days and Doses Highest Dose in Grams
			Both Lungs	Each Lung				Actual	Standard				Previous	Residence		
1 M., 17	On Admis'n At Dis-ch'rge	Far Adv. Progress.	III III	R^3 $R^3 L^3$	4 months 11 months	Favorable Favorable	Unimpaired Unimpaired	128 141	125	75-102 76- 90	98.6 98.8	+ O		O	O O	O. T. .050 45 doses 220 days
2 M., 32	A D	Far Adv. Arrested	III III	$R^3 L^3$ $R^3 L^3$	19 months 36 months	Favorable Favorable	Unimpaired Unimpaired	130 171	136	90-100 72- 80	98.1 97.9			+	O O	O. T. .000 } 108 doses, T. R. .000001 } 504 days
3 M., 19	A D	Far Adv. Progress.	II III	$R^1 L^2$ $R^2 L^2$	15 months 25 months	Unfavorable Unfavorable	Unimpaired Unimpaired	117 116½	125	84- 92	99.2 98.5	O		+	Fistula in Ano " " "	O. T. .00004 } 62 doses, T. R. .000001 } 257 days
4 F., 19	A D	Mod. Adv. Improved	II II	$R^2 L$ $R^2 L$	84 months 93 months	Favorable Favorable	Unimpaired Unimpaired	113¾ 131¼	135		98.5 99			O	O Tub. Laryngitis	O. T. .060 } 68 doses, } 328 days
5 F., 17	A D	Far Adv. Arrested	III III	R^3 R^3	16 months 31 months	Unfavorable Favorable	Unimpaired Unimpaired	89½ 116¾			98 98.4	+		+	O O	O. T. .350 } 83 doses, T. R. .000001 } 470 days
6 M., 22	A D	Mod. Adv. Progress.	II III	R^2 R^3	22 months 24 months	Favorable Favorable	Unimpaired Unimpaired	119 127	120	87-103 89-102	98.8 99		+		O O	O. T. .000002 13 doses, 77 days
7 M., 52	A D	Incipient Arrested	I I	R R	25 months 40 months	Favorable Favorable	Unimpaired Unimpaired	137 140	145	90-116 69- 76	98.4 98	O			O	O. T. 1.0 T. R. .000001 76 doses, 455 days
8 F., 31	A D	Incipient Ap. Cured	I	R	6 months 16 months	Favorable Favorable	Unimpaired Unimpaired	126 140	124	68- 82	98.9 99	O			O	O. T. .02 65 doses, 312 days
9 F., 22	A D	Incipient Improved	I I	R R	14 months 29 months	Favorable Favorable	Unimpaired Unimpaired	98 102	120	98-104 98-116	98.6 99.3			+	....	O. T. .06 T. R. .0001 71 doses, 450 days
10 M., 31	A D	Far Adv. Arrested	III III	$R^1 L^3$ $R^1 L^3$	18 months 26 months	Favorable Favorable	Unimpaired Unimpaired	132 142	132	80- 86 80- 89	98.8 98.8			+	Tuberculous Laryngitis	O. T. .08 46 doses, 240 days
11 F., 33	A D	Far Adv. Improved	III III	$R^2 L^2$ $R^2 L^2$	41 months 51 months	Favorable Favorable	Unimpaired Unimpaired	99 103	110	60- 88 86- 90	98.4 99			+	Secondary Lues	O. T. .06 T. R. .000001 71 doses, 295 days
12 M., 45	A D	Mod. Adv. Arrested	II II	$R^2 L$ $R^2 L$	21 months 32 months	Favorable Favorable	Unimpaired Unimpaired	158 163	150	84- 84 86- 88	98.2 98.2			O	O	O. T. .050 T. R. .000001 74 doses, 345 days
13 F., 33	A D	Probable Probable	I	R	72 months 87 months	Favorable Favorable	Unimpaired Unimpaired	116 114	100	70- 80 74- 78	98.5 98.5	O			O	O. T. .45 T. R. .000001 75 doses, 450 days
14 F., 27	A D	Incipient Improved	I I	R L R L	60 months 73 months	Favorable Favorable	Unimpaired Unimpaired	160 178	175	72- 84	98.4 99			O	O	O. T. .000009 61 doses, 390 days
15 M., 41	A D	Mod. Adv. Ap. Cured	II	L^2	6 months 15 months	Favorable Favorable	Unimpaired Unimpaired	147 148		80- 87 88- 92	98 98.4	O		O	O	O. T. .055 60 doses, 270 days
16 F., 34	A D	Incipient Ap. Cured	I	R L	6 months 19 months	Favorable Favorable	Unimpaired Unimpaired	117 137	132		98.1 98	O		O	Neurasthenia	O. T. .02 79 doses, 392 days
17 F., 18	A D	Incipient Ap. Cured	I	R	8 months 12 months	Favorable Favorable	Unimpaired Unimpaired	132 126	125	84-100 88- 96	98.6 98.6				....	O. T. .150 31 doses, 118 days
18 F., 16	A D	Incipient Progress.	I I	R L R L	10 months 13 months	Favorable Favorable	Unimpaired Unimpaired	154 148	135	72- 92 80- 96	98.6 98.8				O	O. T. .0006 14 doses, 88 days
19 F., 35	A D	Far Adv. Improved	III III	$R^1 L^3$ $R^1 L^3$	19 months 29 months	Unfavorable Unfavorable	Unimpaired Unimpaired	111 121		80- 96	99 99.4	+		+	O	O. T. .001 T. R. .000001 55 doses, 305 days
20 M., 21	A D	Far Adv. Progress.	III III	$R^1 L^2$ $R^1 L^2$	16 months 30 months	Favorable Favorable	Unimpaired Unimpaired	142 155	154		98.8 98.6			+	O	O. T. .1 T. R. .000001 102 doses, 418 days
21 M., 27	A D	Mod. Adv. Ap. Cured	II II	$R^2 L$ $R^2 L$	96 months 110 months	Favorable Favorable	Unimpaired Unimpaired	130 134	138	78- 99	97.8 Bel. 99			+	O	O. T. .0 3 53 doses, 420 days
22 F., 25	A D	Mod. Adv. Improved	II II	R^2 R^2	16 months 25 months	Favorable Favorable	Unimpaired Unimpaired	99 105	125		99 98.2	O			Fever Pregnancy	O. T. .0002 47 doses, 270 days
23 M., 18	A D	Probable Probable	I	R	4 months 7 months	Favorable Favorable	Unimpaired Unimpaired	135 135	138		98.7 Bel. 99			O	O	O T. .0004 22 doses, 80 days

TABLE I.—Continued.

No. Sex Age	Condition		Extent of Physical Signs (Turban) Both Lungs	Each Lung	Duration of Disease	General Condition	Digestion	Weight Actual	Weight Standard	Range of Pulse 7 days on Admission 2 days on Discharge	Av. Max. Temp. 7 days on Admission 2 days on Discharge	T. B. Previous	T. B. Residence	Complications	Tuberculin Variety, No. of Days and Doses Highest Dose in Grams
24 M., 51	A D	Far Adv. Progress.	III III	R^1 L^2 R^2 L^3	5 months 25 months	Unfavorable Unfavorable	Unimpaired Unimpaired	121 131	143	67- 90	100.9 101	+ +	+	O	O. T. .000009 T. R. .000001 H. B. F. .0000003 105 doses, 500 days
25 M., 25	A D	Mod. Adv. Progress.	II III	R^2 L^1 R^3 L^1	18 months 30 months	Favorable Favorable	Unimpaired Unimpaired	162 158	154	60- 75 64- 68	98.2 98.2	+		O	O. T. .050 T. R. .000001 68 doses, 345 days
26 M., 39	A D	Mod. Adv. Improved	II II	R^1 L^1 R^1 L^1	6½ months 17 months	Favorable Favorable	Unimpaired Unimpaired	138 150	150	72- 90 78- 83	98.4 98.3		O	Pleurisy with Effusion	O. T. .0008 T. R. .000001 72 doses, 340 days
27 M., 34	A D	Far Adv. Arrested	III III	R^3 L^3 R^2 L^2	3 months 11 months	Favorable Favorable	Unimpaired Unimpaired	107 118		84- 86	99 98.7	+ +	+	O	O.T. .03 T.R. .000001 H. B. F. .00008 121 doses 250 days
28 F., 40	A D	Far Adv. Progress.	III III	R^2 L^2 R^2 L^2	37 months 53 months	Favorable Unfavorable	Unimpaired Impaired	123 113			99.1 100.2	+	+	O	O. T. .0002 H. B. F. .00000002 61 doses, 270 days
29 F., 23	A D	Mod. Adv. Improved	III III	R^1 L^3 R^1 L^3	2 months 9 months	Favorable Favorable	Unimpaired Unimpaired	131 140	135		98.4 98.4			Pregnancy	O. T. .0002 27 doses, 128 days
30 F., 31	A D	Far Adv. Progress.	III III	R^3 L^1 R^2 L^3	9 months 14 months	Unfavorable Unfavorable	Impaired Impaired	109 108			98.7 98.6	+	+	Tuberculous Laryngitis	O. T. .000008 36 doses, 154 days
31 M., 20	A D	Mod. Adv. Arrested	II II	R^2 L^1 R^2 L^1	2 months 8 months	Favorable Favorable	Unimpaired Unimpaired	130 148	135	80- 90	97.5 Bel. 99	+ +	O	O	O. T. .0003 T. R. .000001 37 doses, 190 days
32 F., 16	A D	Incipient Ap. Cured	I I	R L R L	54 months 69 months	Favorable Favorable	Unimpaired Unimpaired	97 105		80- 90	99.3 98.3		O +	O	O. T. .0008 B. B. F. .000004 69 doses, 450 days
33 F., 24	A D	Far Adv. Progress.	III III	R^1 L^3 R^2 L^3	9 months 27 months	Unfavorable Unfavorable	Impaired Impaired	108 110	105	90- 98	99 100.4	+	+	....	O. T. .000008 H. B. F. .0000005 93 doses, 590 days
34 F., 26	A D	Probable Probable	I I	R L R L	72 months 80 months	Favorable Favorable	Unimpaired Unimpaired	90 102		66- 86 76- 82	99.1 99.1	O		Tonsillitis Pelvic Disorder	O. T. .00003 24 doses, 165 days
35 F., 26	A D	Incipient Arrested	I I	R L R L	11 months 16 months	Favorable Favorable	Unimpaired Unimpaired	155 174	176	68- 80 78- 90	98.9 99.1	+		O	O. T. .00035 30 doses, 156 days
36 F., 25	A D	Probable Cured	I	R	11 months 24 months	Favorable Favorable	Unimpaired Unimpaired	151 144	140	64- 82 72- 78	98.5 98.4	O	O	O	O. T. .012 79 doses, 387 days
37 F., 20	A D	Incipient Ap. Cured	I	R L	13 months 29 months	Favorable Favorable	Unimpaired Unimpaired	106 104	110	76-100 86- 84	98.4 98.5	O	+	Hemorrhoids	O. T. .00009 H. B. F. .015 96 doses, 462 days
38 M., 24	A D	Far Adv. Progress.	III III	R^2 L^3 R^3 L^3c	Several Yrs. Several Yrs.	Unfavorable Unfavorable	Impaired Impaired	124 110	145		100.5 100.7			Aortic Insufficiency	O. T. .000005 23 doses, 245 days
39 F., 20	A D	Probable Probable	I I	R R	3 months 12 months	Favorable Favorable	Unimpaired Unimpaired	114 121	118		98.6 Bel. 99	O	O	Old Tuberculous Arthritis	O. T. .045 59 doses, 275 days
40 F., 22	A D	Far Adv. Died	III III	R^2 L^3 R^2 L^3c	28 months 33 months	Unfavorable Unfavorable	Unimpaired Unimpaired	109 100	128	84- 98	98.4 99		+	O	O. T. .000001 26 doses, 140 days
41 F., 26	A D	Far Adv. Progress.	III III	R^3 L R^3 L^2	60 months 65 months	Favorable Unfavorable	Unimpaired Unimpaired	122 119	125		98.5 98.4			Tuberculous Laryngitis	O. T. .00004 33 doses, 145 days
42 M., 20	A D	Probable Probable	I I	R L R L	2 months 6 months	Favorable Favorable	Unimpaired Unimpaired	118 124	132	80- 82 68- 74	98.6 98.3	O	O	O	O. T. .00001 28 doses, 135 days
43 F., 47	A D	Incipient Ap. Cured	I	R L	7 months 21 months	Favorable Favorable	Unimpaired Unimpaired	127 126		80-100 80- 88	98.8 97.8		O	O	O. T. .3 77 doses, 420 days
44 F., 19	A D	Far Adv. Arrested	III III	R^3 L^2 R^3 L^2	5 months 19 months	Unfavorable Favorable	Unimpaired Unimpaired	107 116		80- 90	98.7 99	+		O	O. T. .002 90 doses, 422 days
45 M., 40	A D	Mod. Adv. Arrested	II I	R^1 L^1 R^1 L^1	13 months 20 months	Favorable Favorable	Impaired Unimpaired	109 113		70- 84	98.8 98.1		+	Tinea Versicolor	O. T. .0005 43 doses, 221 days
46 F., 16	A D	Mod. Adv. Improved	II II	R^2 L R^2	5 months 18 months	Favorable Favorable	Impaired Unimpaired	91 108	95		98.2 98.6		+	Hemoptysis	O. T. 1.0 85 doses, 390 days
47 M., 22	A D	Far Adv. Arrested	III III	R^3 L^1 R^3 L^1	5 months 19 months	Unfavorable Favorable	Unimpaired Unimpaired	125 129	135	88- 94 78- 90	99 98.9		+	O	O. T. .012 97 doses, 515 days

TABLE I.—Concluded.

No. Sex Age	Condition		Extent of Physical Signs (Turban) Both Lungs	Each Lung	Duration of Disease	General Condition	Digestion	Weight Actual	Weight Standard	Range of Pulse 7 days on Admission 2 days on Discharge	Av. Max. Temp. 7 days on Admission 2 days on Discharge	T. B. Previous	T. B. Residence	Complications	Tuberculin Variety, No. of Days and Doses Highest Dose in Grams
48 F., 29	A D	Far Adv. Arrested	III III	R^2 L^2 R^2 L^2	6 months 18 months	Favorable Favorable	Unimpaired Unimpaired	122 135	125	92–108 86– 88	98.4 99		+	O	O. T. .001 86 doses, 360 days
49 M., 25	A D	Far Adv. Progress.	III III	R^2 L^2 R^2 L^2	24 months 27 months	Favorable Favorable	Unimpaired Unimpaired	123 125	127	76– 94	99.1 98.4			O	O. T. .0000001 18 doses, 101 days
50 M., 36	A D	Probable Probable	I I	R L R L	15 months 29 months	Favorable Favorable	Unimpaired Unimpaired	144 143	159		98.2 98.2	O	O	O	O. T. .007 50 doses, 410 days
51 F., 23	A D	Probable Probable	I I	R L R L	12 months 17 months	Favorable Unfavorable	Unimpaired Unimpaired	131 130		90–120	99.8 100		O	Conjunctivitis	O. T. .0000005 H. B. F. .0000002 18 doses, 160 days
52 M., 22	A D	Far Adv. Progress.	III III	R^3 L^3 R^3 L^3	60 months 68 months	Unfavorable Unfavorable	Unimpaired Unimpaired	130 130	136	84– 99 78–100	99.4 99.5	+ +	+	O	O. T. .00000003 H. B. F. .0000005 33 doses 239 days
53 F., 18	A D	Incipient Ap. Cured	I	R L	2 months 12 months	Favorable Favorable	Unimpaired Unimpaired	142 154	146	68– 80	97.8 98.1	O		O	O. T. .1 63 doses, 305 days
54 M., 27	A D	Far Adv. Progress.	III III	R^2 L^3c R^2 L^3c	8 months 19 months	Unfavorable Unfavorable	Unimpaired Unimpaired	144 147	155	76–104	102.2 100.0	+	+	O	O. T. .000005 H. B. F. .0000004 51 doses, 345 days
55 M., 18	A D	Probable Probable	I I	R L R	7 months 20 months	Favorable Favorable	Unimpaired Unimpaired	131 139	132	76– 96	98.6 99.4	O	O	Epilepsy	O. T. .0000008 H. B. F. .002 76 doses, 365 days
56 M., 36	A D	Probable Probable	I	R L	15 months 27 months	Favorable Favorable	Unimpaired Unimpaired	123 130			99.1 Bel. 99		O	O	O. T. .15 67 doses, 355 days
57 M., 24	A D	Probable Probable	I I	R R	60 months 67 months	Favorable Favorable	Unimpaired Unimpaired	145 144	162	80–116	98.3 99	O	O	O	H. B. F. .0000005 O. T. .0000005 27 doses, 190 days
58 M., 20	A D	Mod. Adv. Improved	III I	R^3 L R L	½ month 9½ months	Favorable Favorable	Unimpaired Unimpaired	144 162		64– 88 70– 90	98.1 97.9		O	Herpes Zoster	O. T. .003 54 doses, 270 days
59 F., 15	A D	Incipient Ap. Cured	I	R L	36 months 40 months	Favorable Favorable	Unimpaired Unimpaired	122 125			98.7 Bel. 99	O	O	O	O. T. .0003 43 doses, 105 days
60 M., 31	A D	Mod. Adv. Improved	II II	R^2 L R^2 L	6 months 17 months	Favorable Favorable	Unimpaired Unimpaired	154 175	155	84– 90	98.8 98.9	O	O	Hemoptysis	O. T. .000007 H. B. F. .0003 76 doses, 340 days
61 M., 16	A D	Far Adv. Improved	II II	R^2 L R^2 L	3 months 13 months	Favorable Favorable	Unimpaired Unimpaired	122 133	122		98.9 99	+	O	Fever	O. T. .00000003 H. B. F. .03 59 doses, 310 days
62 F., 18	A D	Probable Probable	I	L	16 months 26 months	Favorable Favorable	Unimpaired Unimpaired	104 106	110	60– 90	98.8 98.6			O	O. T. .0000002 H. B. F. .0015 58 doses, 300 days
63 F., 20	A D	Doubtful Doubtful	I I	R R	12 months 19 months	Favorable Favorable	Unimpaired Unimpaired	102 103	122	64– 96 89– 99	97.8 99.2	O		O	H. B. F. .00003 47 doses, 210 days
64 F., 39	A D	Mod. Adv. Arrested	I I	R L R L	48 months 56 months	Favorable Favorable	Unimpaired Unimpaired	108 120	121	64– 100 86– 100	98.9 99.1		O	Deltoid Bursitis	O. T. .0003 57 doses, 240 days
65 M., 23	A D	Far Adv. Arrested	III II	R^2 L^2 R^2 L^2	4 months 13 months	Favorable Favorable	Unimpaired Unimpaired	128 135		62– 88 70– 76	98.8 98.3	+	O	O	H. B. F. .0000007 41 doses, 274 days
66 F., 24	A D	Probable Probable	II II	R^2 L^3 R^2 L^3	7 months 14 months	Favorable Favorable	Impaired Impaired	106 113		75– 80	98.7 99	O	O	Hyst. Aphonia and Abd. Attacks	H. B. F. .00005 45 doses, 215 days
67 F., 18	A D	Far Adv. Progress.	III III	R^2 L^3 R^2 L^3	8 months 12 months	Unfavorable Unfavorable	Impaired Impaired	101 98	110	70–100 90–112	98.9 99.4	+		O	H. B. F. .0000007 27 doses, 122 days
68 F., 28	A D	Mod. Adv. Arrested	II II	R^2 L R^2 L	36 months 43 months	Favorable Favorable	Unimpaired Unimpaired	119 140	117	76– 94 72– 80	99.3 98.6	O	O	O	H. B. F. .00008 49 doses, 200 days
69 M., 20	A D	Far Adv. Progress.	III III	R^2 L^2 R^2 L^2	14 months 20 months	Unfavorable Unfavorable	Unimpaired Unimpaired	129 129	138		98.2 98.8	+	+	O	H. B. F. .000002 40 doses, 190 days
70 F., 18	A D	Far Adv. Progress.	II II	R^1 L^3 R^1 L^2	9 months 13 months	Favorable Favorable	Unimpaired Unimpaired	166 169	185	90–120 79–115	99 98.6		+	Pleurisy with Effusion	H. B. F. .000003 16 doses, 115 days
71 M., 18	A D	Far Adv. Arrested	II II	R^2 L R^2 L	4 months 10 months	Favorable Favorable	Unimpaired Unimpaired	130 139	122	68– 73	98.7 98.5		+	O	H. B. F. .0002 34 doses, 182 days

TABLE II.

Summary of Results of Treatment.

Class	Extent of Physical Signs According to Turban	T. B. Found at Any Time	Hygienic-dietetic Treatment With Tuberculin. Patients Who Took Tuberculin More Than 90 Days. Average Residence, 292 Days					
			Cases	Appar. Cured	Arrested	Improved	Progressive	Died
Incipient	I	O	9=16%	6=67%	1= 11%	1= 11%	1= 11%	.....
"	I	+	4= 7%	2=50%	1= 25%	1= 25%	.....	.....
Moderately Advanced	I	O	1= 2%	.....	1=100%	.....	.....	.....
" "	II	O	7=12%	1=14%	2= 29%	4= 57%	.....	.....
" "	II	+	6=11%	1=17%	2= 33%	1= 17%	2= 33%	.....
" "	III	O	2= 4%	.....	.....	2=100%	.....	.....
Far Advanced	II	+	4= 7%	.....	1= 25%	1= 25%	2= 50%	.....
" "	III	+	21=37%	.....	8= 38%	2= 10%	10= 48%	1= 5%
" "	III	O	3= 5%	.....	.....	.....	3=100%	.....

TABLE III.—AVERAGE GAIN IN WEIGHT.

Probable	3½ lbs.	5½ lbs.	..Apparently cured.
Incipient	6½ "	12 "	.....Arrested.
Moderately advanced.	10 "	12 "	.....Improved.
Far advanced	6 "	⅛ "	.....Progressive.

TABLE IV.—AVERAGE MAXIMUM DOSE OF TUBERCULIN.

	Grams.	Grams.	Cases.
Probable	0.048	0.066 Apparently cured	10
Incipient	0.128	0.101 Arrested	16
Moderately advanced	0.075	0.101 Improved	12
Far advanced	0.028	0.010 Progressive	18

Compiled from Dr. Brown's Series in 24th Annual Report from Adirondack Cottage Sanitarium:

	Grams.	Grams.	Cases.
		0.002 Apparently cured	12
Incipient	0.078	0.147 Arrested	57
Moderately advanced	0.089	0.002 Improved	22
		0.001 Progressive	9

TABLE V.—AVERAGE NUMBER OF DAYS AND DOSES TO REACH MAXIMUM DOSE.

	Doses.	Days.	Days.	Doses.	
Probable	36	191	256	50	...Apparently cured.
Incipient	46	229	216	49	.....Arrested.
Moderately advanced.	46	216	206	48	.....Improved.
Far advanced	33	144	97	23	.....Progressive.

TABLE VI.—AVERAGE TOTAL NUMBER OF DAYS OF TREATMENT AND OF DOSES.

	Doses.	Days.	Days.	Doses.	
Probable	47	264	325	64	...Apparently cured.
Incipient	59	316	314	64	.....Arrested.
Moderately advanced.	54	280	318	61	.....Improved.
Far advanced	59	292	246	46	.....Progressive.

TABLE VII.—AVERAGE NUMBER OF DAYS BETWEEN SUCCESSIVE DOSES.

Probable	5.5	5.1	.....Apparently cured.
Incipient	5.4	4.9	.....Arrested.
Moderately advanced.	5.1	5.1	.....Improved.
Far advanced	4.9	5.3	.....Progressive.

TABLE VIII.—AVERAGE NUMBER OF REACTIONS.

Probable	.3	.4	.....Apparently cured.
Incipient	.46	1.4	.....Arrested.
Moderately advanced	.6	1.1	.....Improved.
Far advanced	1.5	.9	.....Progressive.

TABLE IX.—AVERAGE NUMBER OF DAYS AND DOSES INTERVENING BETWEEN REACTIONS.

	Doses.	Days.	Days.	Doses.	
Probable	160	880	812	160	..Apparently cured.
Incipient	128	687	224	46	.....Arrested.
Moderately advanced.	92	466	289	56	.....Improved.
Far advanced	40	195	273	51	.....Progressive.

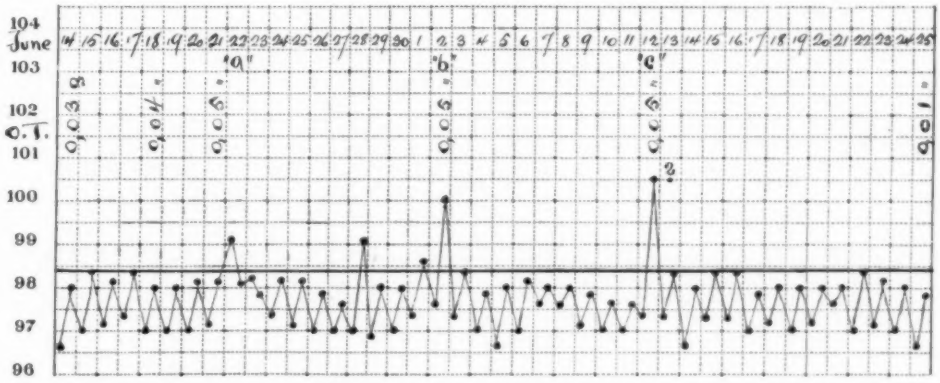

CHART NO. 1. CASE NO. 1077.—At *a* there is a typical reaction to 0,05 gm. followed by a still more severe reaction to the same dose at *b* and *c*. At *c* the patient felt too ill to take his temperature but is confident that it was much higher than during the two preceding reactions. During these reactions there was no increase in the physical signs and patient's general condition did not suffer.

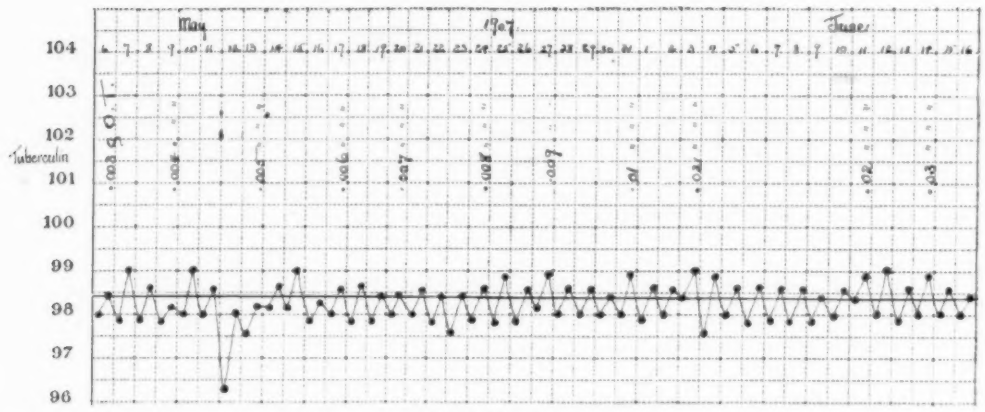

Chart No. 2a.

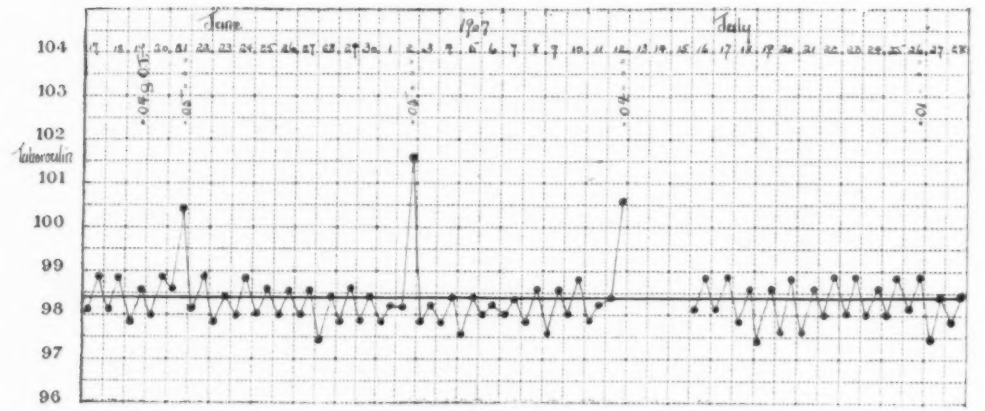

Chart No. 2b.

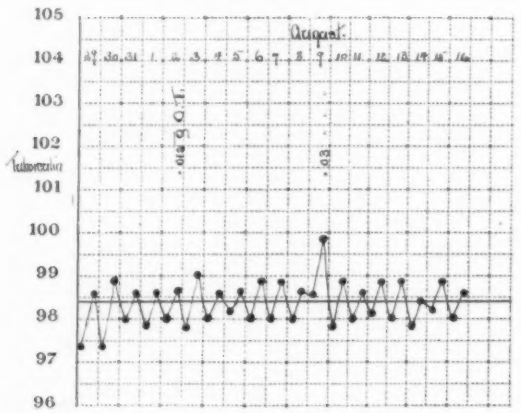

Chart No. 2c.

CHART NO. 2. CASE NO. 1290.—On May 7 and 9 there is a slight febrile reaction with local pain and swelling. On the 15th following 0,005 gm. there is another slight reaction. On the 21st cough is increased after 0,007 gm. On the 25th and the 27th and the 31st and the 3d of June there are slight febrile reactions and on June 3d he had headache and general malaise. There is another slight reaction on the 12th after 0,02 gm. although there were no constitutional symptoms. After 0,05 gm. there is a marked reaction followed by a still more severe reaction upon the repetition of this dose. There is a third reaction to 0,04 gm. and on August 9 a reaction to 0,03 gm. After the three severe reactions the physical signs spread in a remarkable manner. Râles had previously been heard only above and below the clavicle and to the second dorsal spine. They were then present over the whole front and to the angle of the scapula behind and are still present 18 months after treatment was stopped. Patient's general condition suffered too and it was some weeks before he regained his accustomed vigor.

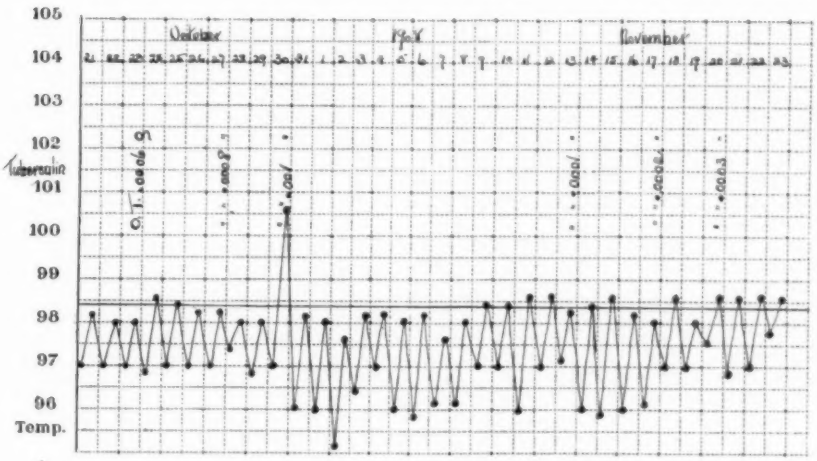

CHART No. 3. CASE No. 2162.—On October 30 when 1 mg. was given it was noted that a large area of infiltration was still present from the previous injection although the patient made no complaint of it. The 1 mg. should not have been given. After decreasing the dose and then ascending the 1 mg. mark was gradually passed.

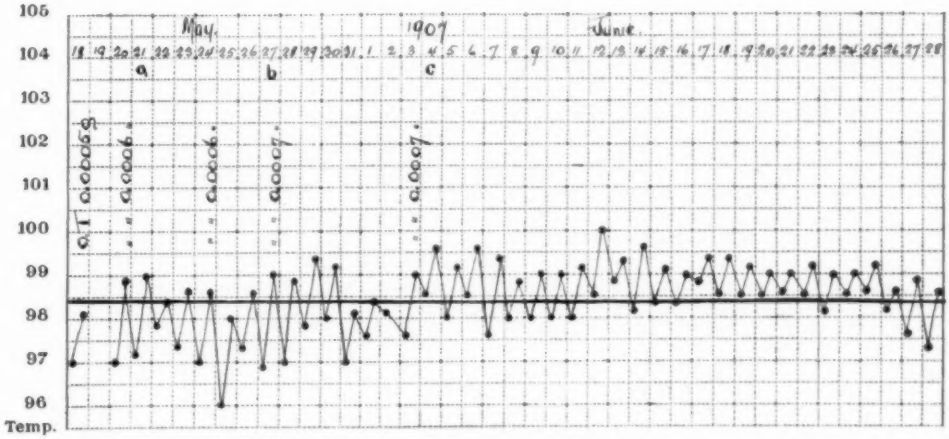

CHART No. 4. CASE No. 1388.—At *a* there is a slight rise of temperature after 0,000,6 gm. When this dose is repeated there is no reaction. At *b* there is a definite elevation of temperature for three days following the injection and on May 31 no injection was given. At *c* after a repetition of the same dose a not severe but a prolonged reaction is induced, associated for the first few days with constitutional symptoms.

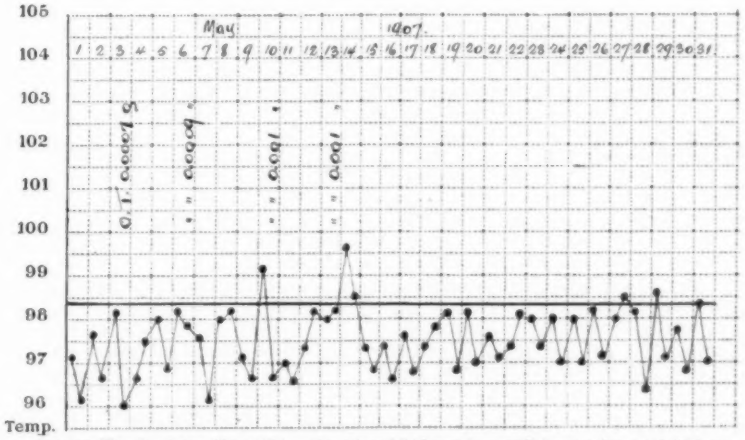

CHART No. 5. CASE No. 1151.—On May 10 there is a mild reaction to 0,001 gm. and a more severe reaction on the 17th when the dose is repeated.

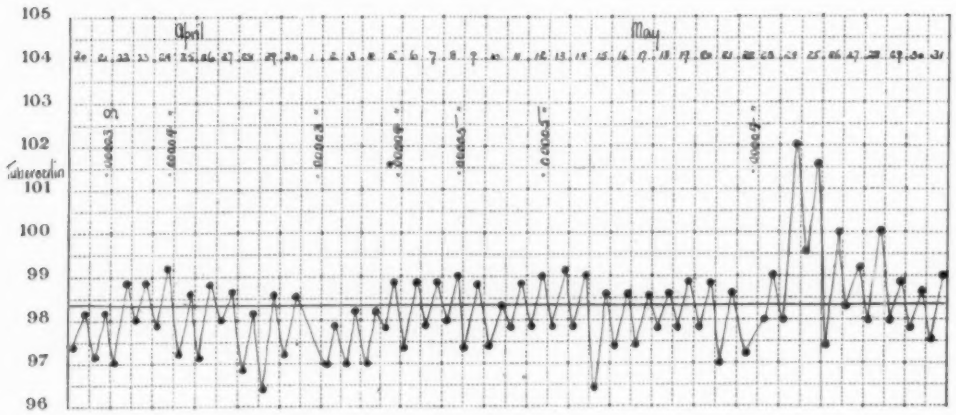

CHART No. 6. CASE No. 2162.—A reaction to 0,000,04 gm. after several previous slight reactions.

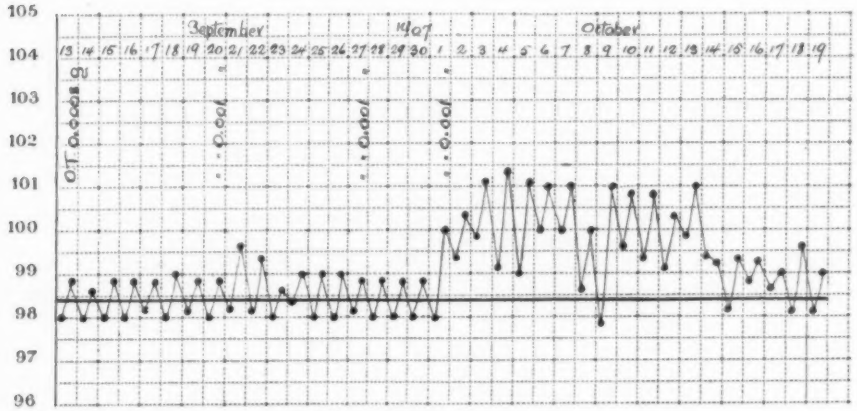

CHART No. 7. CASE No. 1542.—A prolonged reaction after the third dose of 0,001 gm. There had previously been a slight reaction after the same dose.

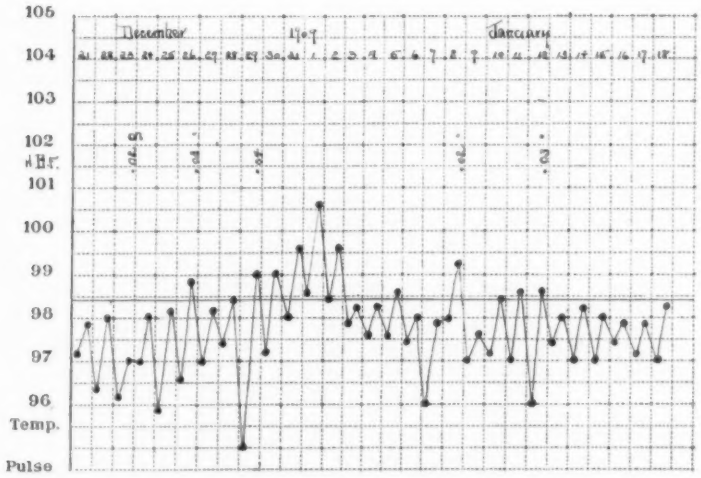

CHART No. 8. CASE No. 2089.—The reaction of January 1 was associated with tonsilitis and was not due to tuberculin injection.

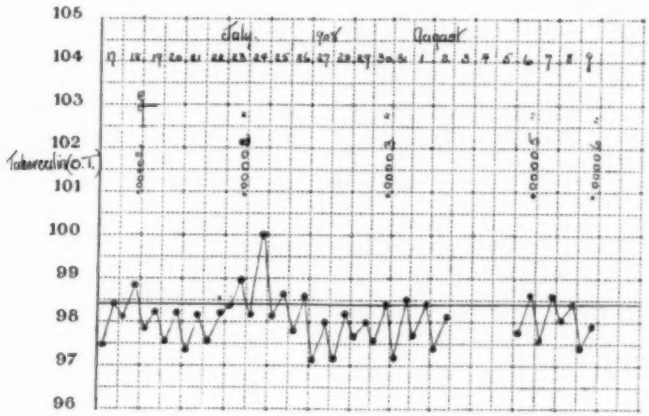

CHART No. 9. CASE No. 1532.—On July 24 there is a rise of temperature which has the appearance of a genuine tuberculin reaction. The patient too had general constitutional symptoms. However, on the same day he developed an attack of tonsilitis. The fact that there is no reaction when the same dose is repeated is a point against its being a tuberculin reaction.

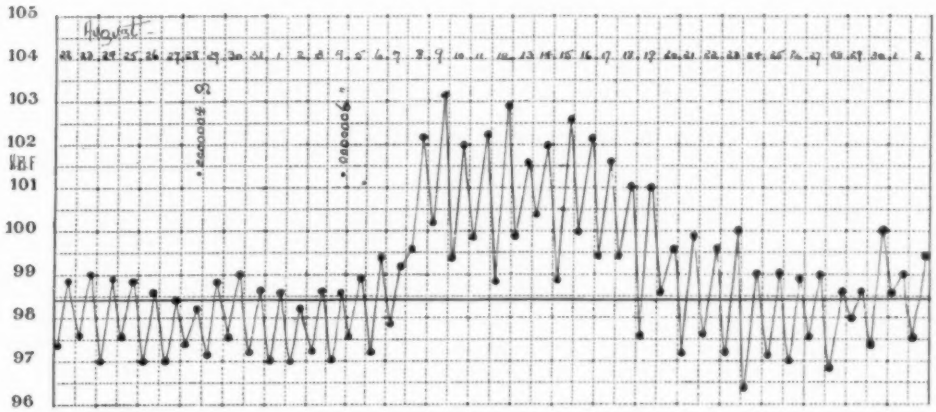

CHART No. 10. CASE No. 3011.—This febrile reaction is certainly quite independent of tuberculin. The temperature did not rise until four days after the injection and there were no local manifestations. The patient had symptoms of grippe.

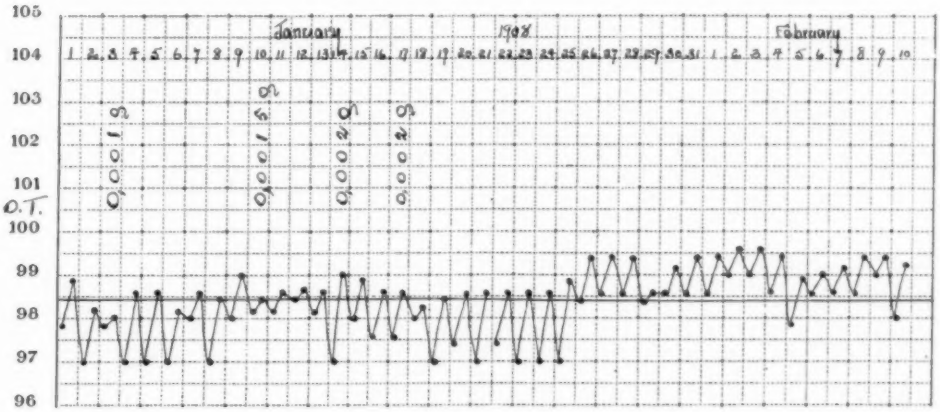

CHART No. 11. CASE No. 394.—Patient began to feel ill on January 21. Headache and pains over the body, and pain in bones. The rise of temperature marks the onset of secondary symptoms of lues.

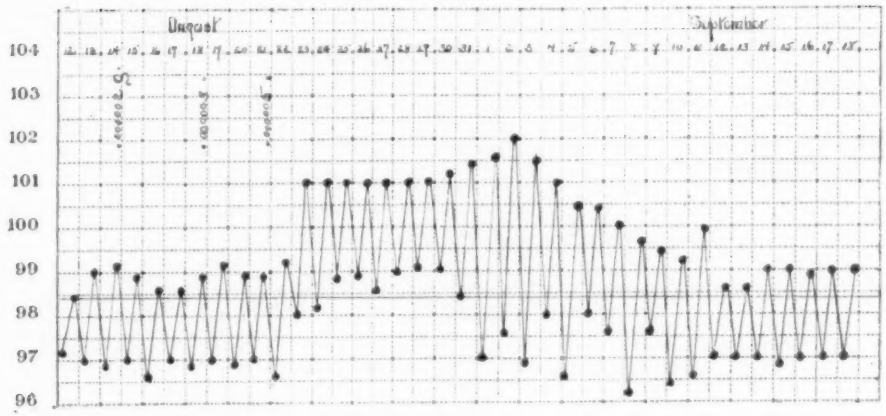

CHART No. 12. CASE No. 2316.—It is difficult to say if this febrile elevation has any relation to tuberculin. The patient did not have pain or swelling at the site of injection and had previously shown no signs of developing intolerance.

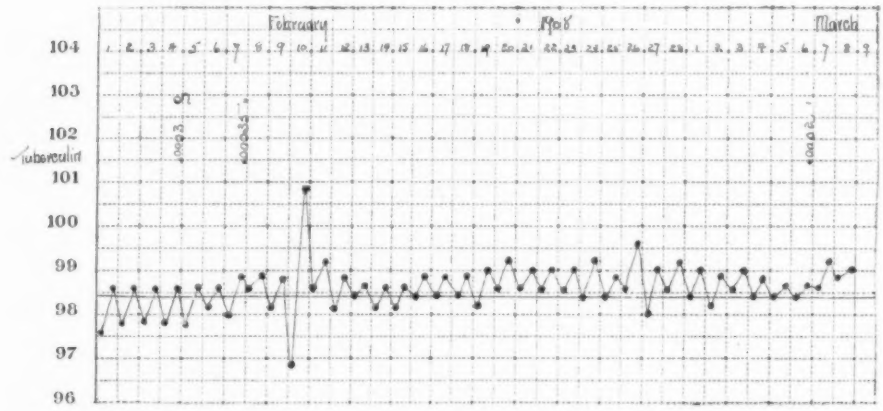

CHART No. 13. CASE No. 1967.—This chart is interesting because there is no special rise of fever until seventy-two hours after the injection. It might be questioned whether this was a genuine reaction. It was not preceded by premonitory symptoms. However, after the injection of March 6 there was a slight rise of temperature with marked pain and swelling at site of injection, showing that the sensitiveness to tuberculin had been greatly increased.

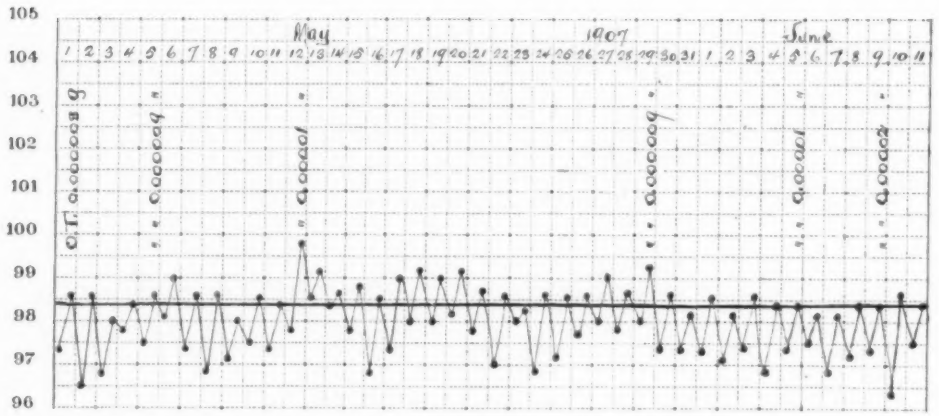

CHART No. 14. CASE No. 1217.—After the injection on May 5, patient had local pain and swelling. After omitting one dose he received a still higher dose followed by a prolonged reaction accompanied by marked constitutional symptoms for the first few days and a prolonged period of general malaise. On the 29th there is a slight reaction with constitutional symptoms to a smaller dose. No further reactions although the dose is steadily increased.

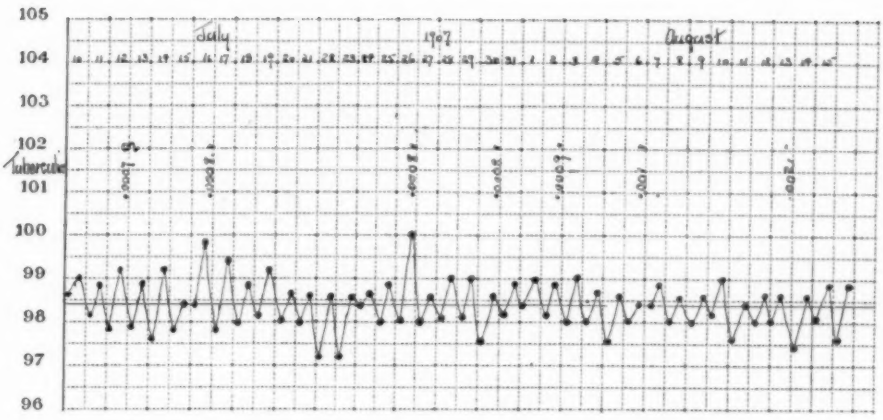

CHART No. 15. CASE No. 830.—On July 16 there is a mild reaction and on the 26th another reaction when the same dose is repeated after a pause of 10 days. There are no further reactions although the dose is steadily increased.

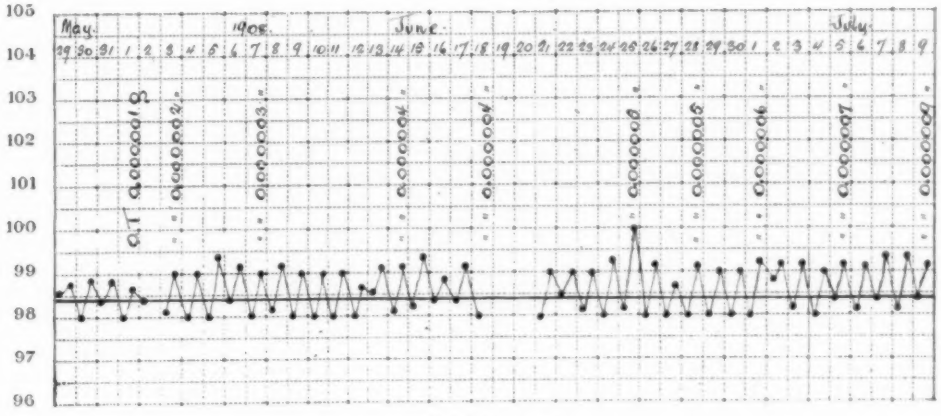

Chart No. 16a.

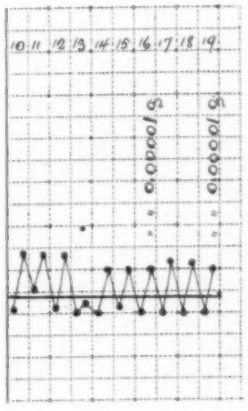

Chart No. 16b.

CHART No. 16. CASE No. 1542.—This chart shows a number of slight reactions to small doses. The dose is gradually increased and tolerance acquired.

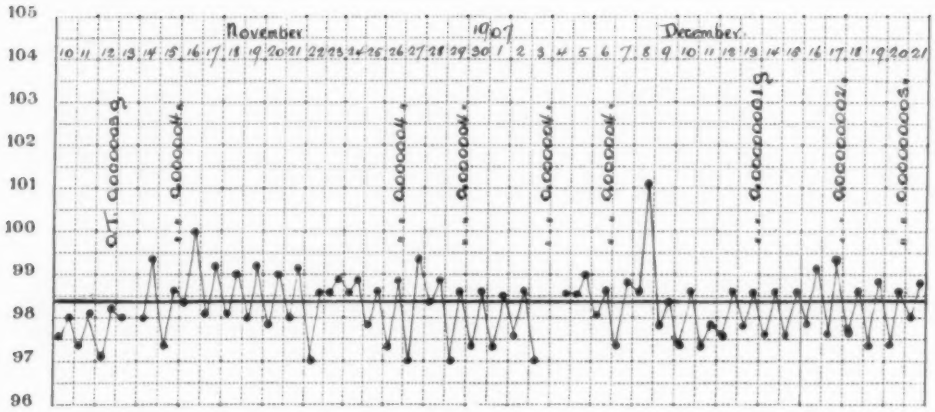

CHART No. 17. CASE No. 1336.—This chart shows very well a number of slight reactions to 0,000,004 gm. O. T. with a severe reaction after the fifth dose. There had been local pain and swelling after several of the preceding doses.

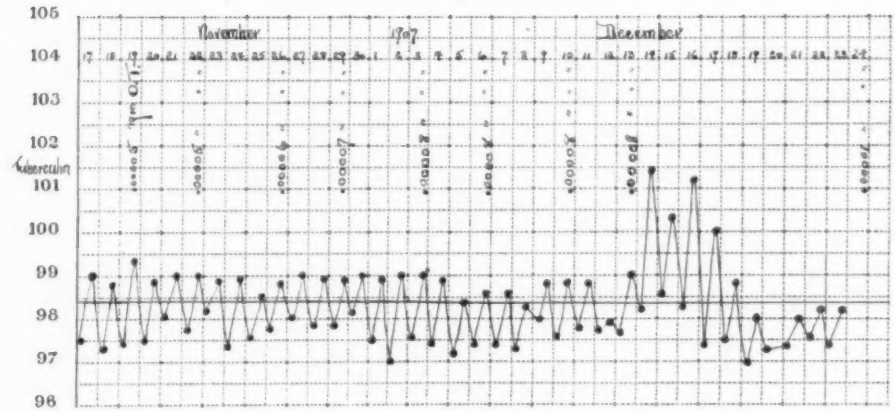

CHART No. 18. CASE No. 1811.—On December 14 there is a characteristic reaction following the fourth dose of 0,000,08 gm. after sensitiveness to previous reactions had appeared at site of injections.

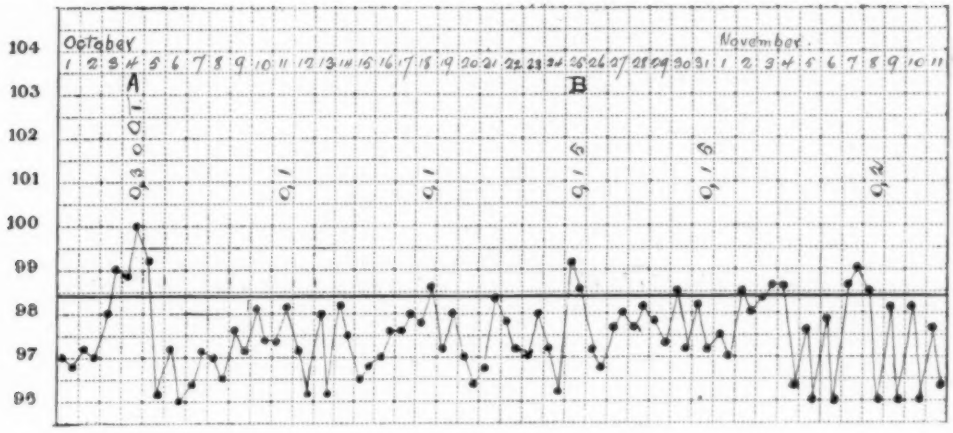

Chart No. 19a.

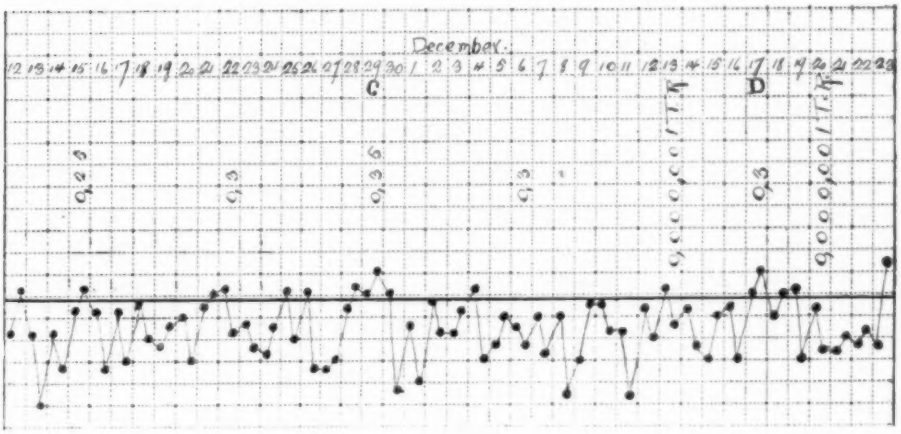

Chart No. 19b.

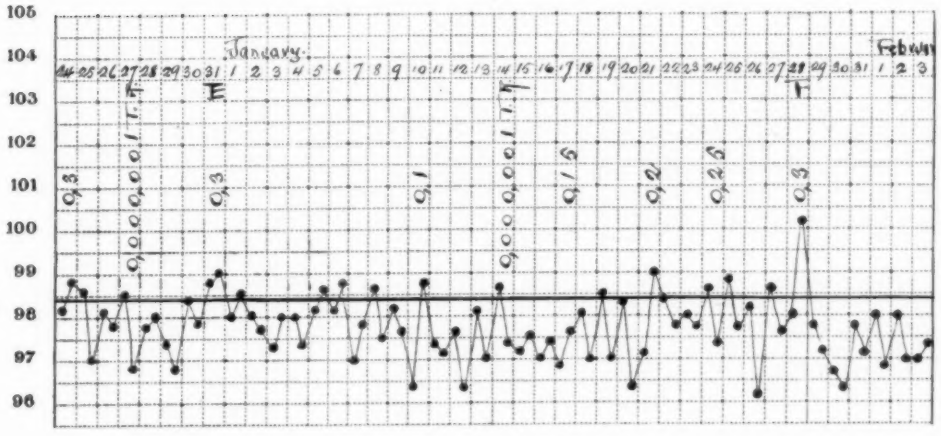

Chart No. 19c.

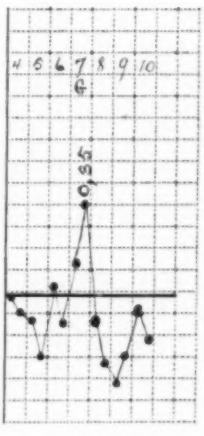

Chart No. 19d.

CHART No. 19. CASE No. 1151.—In this chart 0,3 gm. is approached three times, but is not passed successfully. At *A* there is a reaction to 0,3 gm. The dose is then reduced but at *B* there is a mild reaction to 0,15 gm. Upon the repetition of this dose there is no reaction. At *C* there is a mild reaction to 0,35 gm. and at *D* another reaction to 0,30 gm. Each reaction being accompanied by constitutional symptoms. At *E* and at *F* there are again definite reactions to 0,3 gm. and at *G* a reaction to 0,35 gm. These last reactions although the temperature was higher were accompanied by fewer constitutional symptoms than the preceding reactions.

A FURTHER REPORT OF THE WORK IN THE PHIPPS DISPENSARY FOR TUBERCULOSIS OF THE JOHNS HOPKINS HOSPITAL.

By Louis Hamman, M. D.,
Associate in Medicine, The Johns Hopkins University,

AND

Samuel Wolman, M. D.,
Assistant in Medicine, The Johns Hopkins University.

In the Johns Hopkins Hospital Bulletin for August, 1907, is a brief report of the first two years' work in the Phipps Dispensary for Tuberculosis. The report begins with the opening of the dispensary on March 1, 1905, but for some years, before the gift of Mr. Phipps made possible the erection of a special department for tuberculosis, efforts had been directed in the general medical clinic towards special study and supervision of the tuberculous cases. The origin and character of these efforts are not without interest, and as they have never been published they are briefly given here.

In 1898 the special study of tuberculosis was commenced by Prof. William Osler at the Johns Hopkins Hospital through funds provided by himself and interested friends, and Dr. Charles D. Parfitt was appointed to conduct the work and remained actively employed for one year.

In 1900, Dr. William Osler founded The Lænnec, a society for the study of tuberculosis, and stimulated special study of the tuberculous cases in the dispensary. Subsequently Blanche N. Epler, Adelaide Dutcher, and Elizabeth H. Blauvelt, all medical students, undertook the work during the two following years, visited the tuberculous poor of Baltimore and reported on their home conditions. Afterwards for a year or more all cases of pulmonary tuberculosis coming to the medical clinic were referred to Dr. Herman Bruelle, who gave them his special attention.

In 1903, Mr. Henry Phipps learned of the work of Dr. Osler, and through him became interested in the out-door tuberculosis work of the hospital, and his gift of ten thousand dollars ($10,000), subsequently increased to thirty-one thousand two hundred and fifty dollars ($31,250), made it possible to erect and equip a building, and constitute an entirely distinct clinic for tuberculous patients. The building was formally opened on February 21, 1905, and the first patients received on March 1, of the same year. About this time, through the interest and generous support of Mr. Victor Bloede, a nurse was appointed to visit the patients in their homes and instruct them in the current methods of prevention.

Table No. I shows the increase in the amount of work the dispensary has done during the first three years. Table No. II the work by month during the first six months of this year. Our patients, as heretofore, have come from many sources. The connection of the dispensary with the large out-patient department of the hospital gives unusual advantages for obtaining abundant and varied material. Patients coming to the clinic for relief are sent directly to the Phipps Dispensary if their symptoms suggest tuberculosis and are transferred from the other departments if the examination points to the presence of the disease. This is the main source of our material. Many cases, however, are referred to us for examination by the visiting nurses, by the agents of the Federated Charities Society, by the State Society for the Prevention of Tuberculosis, by the City Board of Charities, and by private individuals. The visiting nurses have been particularly active in sending other members of the tuberculous patient's family for examination, and in persuading many suspected individuals to come for diagnosis. To their zeal we owe the discovery of many of our earliest cases.

The municipal importance the dispensary has assumed is best illustrated by the statement that one-third of all the cases of tuberculosis reported from the State of Maryland to the Board of Health are reported from the Phipps Dispensary, and over one-half of all the cases of tuberculosis referred from the entire city to the Instructive Visiting Nurses' Association are referred from the Phipps Dispensary. Indeed the dispensary has become a convenient clearing house for the social workers of the city, and while we owe much of our success to their hearty co-operation and assistance the extent of the co-operation is a striking comment on the need and the appreciation of such a special clinic as the Phipps Dispensary.

Table No. I.—Attendance at the Dispensary by Year.

	1905	1906	1907
Total number of cases	639	835	1038
Cases of Pulmonary Tuberculosis	455	501	641
Cases of Tuberculosis other than Pulmonary	10	18	7
Doubtful cases of Pulmonary Tuberculosis	88	116	276
Non-tuberculous cases	86	159	78

Table No. II.—Dispensary Attendance by Month.

1908	Jan.	Feb.	Mar.	April	May	June
Total No. of visits to Dispensary	821	819	959	876	892	851
No. patients under treatment	318	306	374	316	321	385
No. of new patients registered	117	93	150	127	116	119
No. hours of clinical work	298	324	341	372	413	347
No. of physicians	12	12	13	16	16	13

The distribution of the work of the nurses has undergone a complete change. Previously the nurse connected with the dispensary divided with the two tuberculosis nurses, associated with the Instructive Visiting Nurses' Association, the task

of visiting the tuberculous poor of the city. The Maryland Association for the Prevention of Tuberculosis now supports five nurses who attend to the routine visiting and instructing of the tuberculous. To these we refer all cases not possessing special interest, and through meetings arranged between the dispensary staff and the nurses they learn something of the patients' condition from a medical standpoint, and we, in turn, of their home and social environment. The character of the work the visiting nurses have done and their grasp of the true significance of the work and the fundamental principles involved needs no other comment than the papers read by Miss Lent[1] and Miss LaMotte[2] at the International Congress for Tuberculosis in Washington.

The two special nurses now directly connected with the dispensary give all their time to aid in the careful study and control of particular cases. In the dispensary they attend to the administration of tuberculin, which has become such an important part of the work. They teach patients to take their temperature and pulse and properly record their symptoms. They follow the patients into their homes and supervise the necessary hygienic changes in their mode of living, and see that they understand the instructions they have received, and put them promptly and satisfactorily into practice. Without their aid it would be impossible to get the accurate data so essential for diagnosis or the reliable records and continuous supervision necessary for successful home treatment.

The following figures illustrate the great variety of material which comes to the Phipps Dispensary. Of the 2512 patients registered during the first three years only 1497 were cases of definite pulmonary tuberculosis, 480 were doubtful cases of pulmonary tuberculosis and 325 were cases other than tuberculosis. These figures are the basis for the emphasis we lay upon one special feature of our work, a feature which we believe is more prominent here than elsewhere, namely, the importance given to early diagnosis. The great mass of patients to be seen makes it impossible to study and follow all the cases in the thorough manner desired, so that our attention has been focused particularly upon the early diagnosis of doubtful cases. Tuberculin has lent us invaluable aid in this direction, and we have used it largely as our two special reports show.[3]

Although diagnosis has been and still is the main feature of the work of the dispensary we are gradually developing means for the suitable care of our patients. In 1906 the Phipps Dispensary was formally selected as the examining station for Eudowood Sanatorium and the resident physician, Dr. A. M. Forster, has since then been in attendance at the dispensary three mornings a week to examine applicants. Before the opening of the Bloede Memorial Hospital in December, 1908, only incipient cases were admitted to the sanatorium, and as it is an exceedingly rare occurrence for an early case of tuberculosis to apply for admission, nearly all of the patients were cases discovered and diagnosed in the dispensary. This arrangement gives a satisfactory channel of disposal for a large number of our early cases, and it has filled the sanatorium with a class of favorable patients that cannot be excelled, if rivalled, by any other instituion in the country. During the past summer a similar agreement has been entered into between the dispensary and the Jewish Sanatorium at Reisterstown. Dr. Smirnow, its Resident Physician, comes to the dispensary two days a week to select and examine cases for admission and the arrangement promises to be equally and mutually as agreeable as our relation with Eudowood Sanatorium. As the Jewish Sanatorium is principally for advanced cases and the Bloede Hospital for advanced cases at Eudowood has now been opened, about 90 beds are open to Phipps Dispensary patients. These and the accommodations offered at the Municipal Hospital partly supply our need for the care of ill patients, but they are still quite inadequate to meet the demand. As we have so frequently emphasized, the greatest drawback to the successful handling of the tuberculosis problem is the urgent need of more hospital facilities to care for advanced consumptives.

Mr. Victor G. Bloede[4] has called attention to the important rôle the Phipps Dispensary plays in the chain planned by the Board of Directors of the Eudowood Sanatorium to meet local tuberculosis problems. The Sanatorium, the Hospital, the Farm Colony and the Dispensary are the four links.

We have been able in the past two years to devote considerable time to the home treatment of patients unable to find accommodations in institutions. From forty to fifty patients have been constantly under strict supervision,[5] and our results have been very gratifying. Besides the hygienic control of their mode of living many of these patients have been treated with tuberculin and a small number with Marmorek's serum. Reports of our methods and results are now being prepared. Whatever the ultimate decision as to the value of tuberculin may be, we are strongly of the opinion that the tuberculosis dispensaries should furnish the main evidence for the judgment. They have unbounded material to select from and opportunities for testing its value under conditions unequalled by sanatoria or in private practice. We believe that we have demonstrated that it can be used in the dispensary on a large scale without danger and under satisfactory control.

During the two previous winters the dispensary staff and the nurses have met twice a month to discuss the cases under their care and briefly review current tuberculosis literature. Each member of the staff was assigned a certain number of journals and made responsible for a report of any article appearing in them bearing on tuberculosis. So much time

[1] Charities and the Commons. November 7, 1908.

[2] Not yet published.

[3] Archives of Internal Medicine. June, 1908, and May 1, 1909.

[4] Johns Hopkins Hospital Bulletin, December, 1908.

[5] For assisting in the care of these patients, as well as in innumerable other ways, we find ourselves constantly indebted to the Federated Charities' Society.

was consumed in going over each individual case and so many different subjects came up for discussion at each meeting that it was decided to change the plans of the conferences. Dr. Wolman was made chairman of the history committee, which selects for the general meeting only the histories of cases of special interest and those that are incompletely or unsatisfactorily filled out, so that the attention of the responsible members may be brought to them. As chairman of the Literature Committee, Dr. Moss has arranged an interesting and complete program of study, an outline of which appeared in the BULLETIN for March, 1909.

Through additional gifts by Mr. Phipps, it became possible a year ago to start two other important departments of the dispensary: the laboratory for investigation of problems relating to tuberculosis and a library of tuberculosis literature. Two rooms on the upper floor are devoted to the special needs of research and the laboratory is in charge of a trained investigator who devotes all his time to prosecuting and directing original work. Our library now contains about 300 volumes and additions are being constantly purchased.

Four of the physicians connected with the Phipps Dispensary hold appointments in the Johns Hopkins University and give instruction to medical students in tuberculosis from its valuable material. The Phipps Dispensary is largely used for teaching physical diagnosis to students during their third year of study, and special courses in the diagnosis and management of tuberculous patients are also planned for advanced students.

During the first four years of its existence the work of the Phipps Dispensary has increased to such an extent that it has far outgrown the accommodations of the first building. In October, 1908, Mr. Phipps again came to its aid by giving the means necessary to build an addition. The new building is now completed, and occupied.

STATISTICS.

During the first year 639 patients were admitted; during the second year 835; during the third year 1038, giving a total of 2512. Of this number:

1597, or 63. % were cases of definite pulmonary tuberculosis;
480 " 19 % were doubtful cases of pulmonary tuberculosis;
323 " 13 % were cases other than tuberculosis;
35 " 1.4% were cases of tuberculosis other than pulmonary;
75 " 3 % of the histories are too incomplete to be considered.

A closer analysis of the figures for the third year shows that there was less readiness on the part of the staff in diagnosing cases as definitely not tuberculosis, this group forming 17 per cent during the first two years, but only 8 per cent during the third year.

Of the 35 cases of tuberculosis other than pulmonary:
8 are glandular tuberculosis;
9 " pleurisy with effusions;
9 " fibroid pleurisy;
3 " tuberculcus peritonitis;
2 " tuberculous pericarditis;
1 is bone tuberculosis;
1 is tuberculous cystitis;
1 " tuberculous adentitis and arthritis;
1 " tuberculous epididymitis.

Of the 323 non-tuberculous cases:
21 had bronchitis and emphysema;
18 " valvular disease of the heart;
15 " adenoids;
4 " lobar pneumonia;
6 " bronchiectasis;
3 " bronchial asthma;
3 " typhoid fever;
3 " chronic tonsilitis;
2 " Basedow's disease;
2 " emphysema;
4 " syphilis;
2 " arteriosclerosis;
2 " pharyngeal catarrh;
1 " nasal obstruction;
1 " carcinoma of the stomach;
1 " chronic interstitial nephritis;
1 " hysteria;
1 " purpura rheumatica;
1 " alcoholic gastritis;
1 " muscular dystrophy;
1 " arthritis deformans;
1 " laryngitis;
1 " goitre;
1 " malaria;
1 " chronic constipation.

In the other cases the examination was negative, and no definite diagnosis was made. The large number of doubtful cases is principally due to the frequency with which patients make only one or two visits to the dispensary, and also to the fact that our doubtful class include those cases in which the diagnosis is highly probable but not absolutely certain. Many patients give the wrong address or live out of the city and cannot be followed. Others refuse to return, even when visited by the nurse and urged to do so.

From the 1597 cases of pulmonary tuberculosis, the following statistics are compiled:

AGE.

From 1 to 5 years	5
" 6 " 10 "	32
" 11 " 15 "	54
" 16 " 20 "	254
" 21 " 25 "	294
" 26 " 30 "	260
" 31 " 35 "	216
" 36 " 40 "	177
" 41 " 45 "	104
" 46 " 50 "	83
" 51 " 55 "	51
" 56 " 60 "	32
" 61 " 65 "	18
" 66 " 70 "	4
" 71 " 80 "	2

Age not stated in 11 cases. Thus:

From 21 to 40 years there are 947 or 59.3 per cent of the cases.

From 16 to 45 years there are 1305 or 81.7 per cent of the cases.

Sex and Color.

White males	763
White females	514
Black males	185
Black females	155
Males	59%
Females	41%
Whites	80%
Blacks	20%

Nationality.

Reference is made to birthplace of the parents. Thus under Germans are those whose parents were German, as well as those of German birth.

Nationality not stated in		73
United States	white	590
	black	320
Germans		220
Russians		165
Irish		82
Poles		28
English		18
Austrians		19
Scotch		5
Greeks		7
Norwegians		5
Mauritian		1
Bavarian		1
Lithuanians		3
Galatian		1
Spaniards		2
Canadians		4
Bohemians		15
Sicilian		1
French		4
Hungarians		5
Italians		8
Hebrew		1
Chinese		1
German Jew		1

Mixed Parentage.

United States and German	17
United States and Irish	5
United States and Russian	3
United States and Bohemian	3
United States and English	2
United States and Hungarian	1
United States and Scotch	1
German and Irish	2
German and French	1
Irish and Italian	1
English and Dutch	1

Of the white patients:

46 % are of American descent;
17 % " " German "
13 % " " Russian "
6.4% " " Irish "
1.5% " " Austrian "

The increase of tuberculous patients in the third year over the two preceding years was almost entirely composed of whites; the number of blacks, per year, remaining almost exactly what it had been.

All of the Russians and Austrians are Jewish, giving roughly 15 per cent of the white patients as Jewish.

Condition.

(Figures from the second and third years only.)

Condition not stated	11
Single	563 = 49%
Married	517 = 44%
Widowed	61 = 7%

Exposure.

First year.

	Cases.
History of unusually intimate exposure	44
History of less intimate exposure	102
History of doubtful exposure	53
No history of exposure obtained	228
No data	18

Second and third years.

Conjugal exposure	36
Intimate association in immediate family	218
Intimate association with patient outside of family	43
Exposure in workshop	83
Incidental exposure	64
No history of exposure obtained	602
No data	106

Total.

History of definite exposure in	40%
History of very intimate exposure in	23%
No history of exposure obtained in	56%

In the third year there was a large increase in the number of cases with exposure in the immediate family. This may be explained by the greater efficiency of the dispensary in the surveillance of families with definitely tuberculous members.

The more carefully a patient's past history is inquired into the more often a definite history of exposure is obtained. Our histories are taken largely by students and other inexperienced assistants and the figures represent a very conservative and probably even a very low estimate.

The Initial Symptoms.

Cough	891
Hæmoptysis	135
Influenza or a "cold"	85
General constitutional symptoms, fever, malaise, "run down," etc	103
Pain in chest	124
Pneumonia	23
Pleurisy	13
Typhoid fever	6
Chills and fever	25
Intestinal disorders	14
Dyspnoea	20
Measles	3
Hoarseness	4
Pertussis	3
Enlarged glands	4
Sore throat	10
Bronchitis	3
Dengue	1
Coryza	1

Rheumatism	1
Palpitation of the heart	1
After trauma	1
Pains elsewhere than in chest	5
Sweats	5
Cough and pain	35
Cough with other symptoms	6
Vomiting	6
Nervous trouble	2
Indigestion	3
Swollen limbs	1
Enlarged abdomen	1
Loss of weight	6
Not stated	58

58 % of cases begin with cough;
8.4% " " " " hæmoptysis;
8.5% " " " " constitutional symptoms;
10 % " " " " pain in chest;
5 % " " " as influenza;
1.4% " " " " pneumonia;
1.5% " " " with chills and fever.

The Occurrence of Important Symptoms.

Cough present in all cases except	68
Hæmoptysis in 775 cases	48.5%
Digestion impaired in	588 or 37 %
Sweats in	974 or 61 %

Stage of Disease.

Although Turban's scale was made the standard of comparison, the figures for the second year were compiled by so many different observers that they are not more than roughly accurate. If error has been made, it is in too lenient interpretation. Many cases placed in the first stage belong to the second, and many in the second to the third. The figures for the first and third years have, I believe, been more justly apportioned.

First stage:	first year,	66	second year,	154	third year,	152
Second stage:	" "	160	" "	171	" "	130
Third stage:	" "	214	" "	155	" "	330
Not stated:	" "	5	" "	31	" "	29

Condition of Patients on Admission.

The prognosis made at the time of the first examination gives some idea of the condition of the patient on admission.

Good prognosis given: First year, 50; second year, 57; third year, 87; total, 194=12 per cent.

Doubtful prognosis given: First year, 56; second year, 58; third year, 143; total, 257=16 per cent.

Bad prognosis given: First year, 338; second year, 330; third year, 395; total, 1063=67 per cent.

No prognosis given: First year, 1; second year, 66; third year, 16; total, 83=5 per cent.

Duration of Symptoms Before Admission.

1 to 3 months	269 or	16%
3 " 6 "	276 "	17%
6 " 12 "	291 "	18%
1 " 2 years	259 "	16%
2 " 5 "	244 "	15%
5 " 10 "	108 "	7%
Over 10 "	35 "	2%

Again these figures are valuable only as indications. As is well known, the more searching our inquiries are the longer the duration of symptoms will appear. Ignorant patients, and particularly colored patients, date their illness only from the beginning of serious symptoms.

Complications.

tuberculous.

Laryngitis	95
Bone tuberculosis	17
Pleurisy	33
Ischio-rectal abscess	3
Meningitis	1
Pulmonary fistula	1
Enteritis	3
Otitis media	3
Sinus over sternum	1
Adenitis	11
Peritonitis	3
Fistula	1
Kidney	1
Pneumothorax	2
Hæmaturia	1

non-tuberculous.

Bronchitis and emphysema	9
Pregnancy	9
Mitral insufficiency	3
Aortic insufficiency	5
Laryngitis	1
Insanity	1
Bronchitis	1
Syphilis	4
Herpes zoster	1
Arteriosclerosis	8
Alcoholism	2
Hiccough	1
Hernia	4
Gonorrhœal exostoses	1
Gout	1
Emphysema	1
Mitral stenosis	1
Diabetes	1
Pharyngeal ulcer	1
Pernicious anemia	1
Pneumonia	1
Mitral stenosis and aortic insufficiency	1
Neuritis	1
Diarrhœa	1
Neurasthenia	1
Epistaxis	1

Probably many complications have been omitted. Where a large number of men are engaged in making records, many details are sure to be overlooked.

Results.

The regular visiting of patients by the nurses has given us unusual facilities for following them. The results in all cases, whether sent to a sanatorium or remaining at home under good or bad surroundings, are given below. Only so small a proportion entered institutions, however, that the number is practically negligible.

I. Cases followed for from 3 to 3½ years:

Number of cases of pulmonary tuberculosis in first six months	259
Patients living out of city or lost	102
Number of patients followed	157
Of these are dead	137 or 87%
Of these are living	20 or 13%

Of the 20 living: 4 are improved, 11 remain unchanged, 5 were worse.

II. Cases followed for from 2½ to 3 years:

Number of cases of pulmonary tuberculosis in second six months	171
Patients living out of city or lost	71
Number of patients followed	100
Of these are dead	81 or 81%
Of these are living	19 or 19%

Of the 19 living: 6 are improved, 4 remain unchanged, 9 were worse.

III. Cases followed for from 2 to 2½ years:

Number of cases of pulmonary tuberculosis in third six months	249
Patients living out of city or lost	112
Patients followed	137
Of these are dead	91 or 66%
Of these are living	46 or 34%

Of the 46 living: 16 are improved, 17 remain unchanged, 14 are worse.

IV. Cases followed for from 1½ to 2 years:

Number of cases of pulmonary tuberculosis in fourth six months	239
Patients living out of city or lost	138
Number of patients followed	101
Of these are dead	50 or 50%
Of these are living	51 or 51%

Of the 51 living: 21 are improved, 14 remain unchanged, 16 are worse.

MARMOREK'S SERUM IN THE TREATMENT OF PULMONARY TUBERCULOSIS.

By SAMUEL WOLMAN, M. D.,
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Attempts to utilize the serum of animals in the treatment of tuberculosis have not been few. At first the natural sera of animals immune to or greatly resistant to the disease were experimented with. The next efforts were directed towards the artificial immunization of the animals whose sera were to be employed; and various forms of the tubercle bacillus, its derivatives or culture products were used as immunizing agents. Only two sera, however, have recently held medical attention for more than a brief period—Maragliano's and Marmorek's. For the first there are now no sponsors except a few of Maragliano's own countrymen. But a considerable number of publications attesting the value of Marmorek's serum have within the last five years kept that product from the fate of its fellows.

According to Marmorek[1] himself, the efficiency of his serum is due to his choice of a proper antigen or immunizing substance. He was led to the choice of his antigen by careful and extensive studies of the biology of the tubercle bacillus, and by a critical attitude towards the prevailing theory as to the action of tuberculin. He reasons that in order to obtain an antitoxin to the substance causing the symptoms of tuberculous patients, we must first have in our possession that substance which the bacillus secretes while growing in the human tissues. Tuberculin, which is found in old cultures of the tubercle bacillus, he does not regard as the true toxin of tuberculosis, both because the bacillus in such cultures is in a condition much different from that in the human body, and also on account of what is known of the action of tuberculin. Animals that have not been infected with the tubercle bacillus, tolerate enormous quantities of tuberculin with no unpleasant effects. On the other hand, if the animal has only a slight lesion, a minute quantity of tuberculin produces intense constitutional disturbance—the so-called tuberculin reaction. Thirdly, if the tuberculous process is extensive, even large doses of tuberculin may elicit no reaction. Marmorek argues that if tuberculin were the real symptom-producing substance in tuberculosis there would not be such an enormous difference between its action in uninfected animals and in animals or men with only a slight lesion. On the one hand the introduction of large doses into healthy animals should produce definite symptoms; on the other hand, the introduction of an extremely minute dose into an animal with a very slight lesion should not produce violent effects. It is known too that one of the component events of the tuberculin reaction is "the focal reaction"—an intensification of the physical signs at the tuberculous focus. This focal reaction Marmorek thinks is unexplained by the addition of a minimal amount of toxin to the body; yet it occurs after extremely small doses of tuberculin. He believes it more in accordance with the known facts to regard tuberculin as a substance which upon entering the body stimulates the tubercle bacilli—if they are present—to secrete more actively the true tuberculous toxin. The consequent reaction is due, then, not to the tuberculin but to the substance thereupon secreted. He cites certain experiments of his own as supporting this view of the rôle of tuberculin.[2]

In order to obtain the true tuberculous toxin, he deemed it necessary to furnish the bacillus with a proper habitat. Such a habitat is furnished by his leucotoxic serum, obtained by immunizing the calf against the leucocytes of the guinea-pig. His object was to select a medium in which the bacillus

[1] Marmorek: Arch. gén. de méd., 1903, No. 47; Berl. klin. Wchnschr., 1903, No. 48; Lancet. Lond., 1903, December 12.

[2] Marmorek: Arch. gén. de méd., 1903, No. 52.

would find it difficult to grow. By gradually accustoming itself to this medium the bacillus will become more hardy and secrete more actively. Since the bacillus in animal tissues secretes its noxious substance while surrounded by, or enclosed in leucocytes, the leucocyte must furnish something that facilitates the growth of the organism. An anti-leucocytic serum he expects will therefore produce a resistant strain of bacilli, especially if the leucocytes of the guinea-pig, an animal so susceptible to tuberculosis, be used. In order to enhance the peculiar properties of his leucotoxic serum, he adds thereto a glycerine-bouillon extract of liver—an organ which is especially resistant to the tubercle bacillus. By cultivating the ordinary bacillus of Koch on this medium, Marmorek obtains his "young or primitive bacillus," which differs from the other tinctorially and biologically.[3] Its waxy capsule is thinner, it is not so acid fast, it grows in a finer, smoother film, lacks the characteristic odor, and secretes, very early, not tuberculin, but Marmorek's antigen. The filtrate of these primitive cultures, unlike tuberculin, is fatal to healthy guinea-pigs or rabbits, and in tuberculous animals it produces not a "reaction" but symptoms much the same as in healthy animals, sometimes to a less degree. With this filtrate he immunizes horses, and obtains a serum which he says is an anti-tuberculous, not an anti-tuberculin, serum. The reactions are violent, and it takes about eight months to raise the serum to a utilizable strength. The recent serum is said to be more potent, because of the gradual perfection of the cultures of the primitive bacillus. The serum has been further strengthened by immunizing the horses at the same time against streptococci found in the sputa of tuberculous patients with mixed infection. Marmorek's experiments with the serum before he applied it to human therapy showed that in animals it could act both preventively and curatively, provided in either case the interval is not too long (about three days). In animals the serum is most potent when given intravenously.[4]

Marmorek's antituberculous serum is furnished in bottles of 5 cc. each. There are two varieties—simple and double—the latter containing also antistreptococcic substances. Its first application in human therapy was by the subcutaneous route. Five or 10 cc., sometimes more, were injected daily. In many of the patients after only a few injections, there occurred intense local and general symptoms. There were much pain and swelling at site of injection, and fever, malaise, nausea and vomiting, arthralgias and eruptions (erythematous and urticarial mainly) attended often by intense itching. Sometimes even collapse was threatened. These untoward effects were thought to be due to the specific antibodies of the serum—a fact which would have militated against even any tentative use of the remedy. But from the work of von Pirquet and Schick, and others, it is now known that the symptom-complex is due to the normal constituents of serum, and is the same as that occurring in "serum disease." The phenomenon is a general one, embraced under the term "anaphylaxis," and is thought to be one of the immunity reactions of the body. It has not heretofore attracted attention in sero-therapy, since such therapy had been limited almost entirely to acute diseases, in which the application of the serum was not extended over more than a few days at the most. Here for the first time was an anti-toxin to be applied to a peculiarly chronic disease in which there was need for a steady and prolonged neutralization of continually accumulating toxic substances. Further work showed that the anaphylactic phenomena could be almost entirely avoided by a proper regulation of dose and interval. Those who have used the subcutaneous route most, advise that 5 or 10 cc. be given at intervals of one or more days for about three weeks. Then after a pause of about two weeks, the cycle is again begun. This scheme may be departed from in either direction, as determined by the tolerance of the individual patient.

The serum has been administered also by mouth. No one now speaks for the efficiency of this method. The rectal method was simultaneously recommended by Frey[5] (Davos), and by Mannheim and Hoffa.[6] After evacuation of the bowel, 5 to 20 cc. are injected into the descending colon by means of a syringe to which is attached a long rubber catheter. The serum is given daily for about three weeks. Then follows a pause of about two weeks. This period of administration is selected with a view towards preventing anaphylactic phenomena, but it is known that it may be departed from without the appearance of such symptoms. The rectal method is not only painless, but time saving in that it does not require the rigid asepsis of the subcutaneous method. Nor have arthralgias or eruptions been noted except rarely, and then only in mild form. In some patients there occurs after a time a local irritation of the bowel resulting in abdominal pain, tenesmus, or diarrhœa. Or, without any previous pain, the serum may be expelled shortly after its introduction. In such an event a few drops of laudanum are mixed with the serum when it is given. Should the symptoms then continue, the administration is interrupted for a brief period. Most patients have received the rectal injections, over long periods, without any discomfort whatever. The absence of any symptoms of serum disease when the serum is given rectally, while no doubt an advantage in itself, has led some writers to deny that there is any absorption of even the specific anti-bodies which the serum is said to contain. They point to the work of Escherich with diphtheria antitoxin, which showed that diptheric anti-bodies were not absorbed from the lower bowel. Similar evidence exists also for anti-tetanic serum. The question is in dispute, and all that need be said here is that most of the enthusiasts who have seen the therapeutic effects of the serum, find that they can work cures even when the serum is given rectally. Some authors recommend a combination of the two routes.

[3] Marmorek: Berl. klin. Wchnschr., 1906, No. 11.
[4] Marmorek: Berl. klin. Wchnschr., 1907, No. 20.
[5] Frey: München. med. Wchnschr., 1904, No. 44.
[6] Hoffa: Berl. klin. Wchnschr., 1906, February 19.

The serum has also been injected intravesically in a case of cystitis;[7] and in meningitis it has been given intraspinally.[8]

Marmorek reported the first cases treated with the serum in 1903, at a session of the Paris Academy of Medicine. Since then about 80 reports have appeared. The latest collections of literature have been made by Köhler,[9] and by Frey,[10] in 1908. The evidence is extremely conflicting, and the authors both from their own work and from a review of the literature arrive at opposite conclusions as regards the value of the serum. Frey notes that of the 70 reports, 59 are favorable—and these deal with 833 cases, while the unfavorable conclusions rest on experience with 105 cases. There is the widest divergence of views, some writers, as Faraggi,[11] and Kohler and Jacobson[12] reporting cures of tuberculous pneumonia, while others, as de la Camp,[13] Stadelmann and Benfey,[14] and Mann,[15] see no good effects whatever, even in ordinary cases. Frey's summary is certainly too favorable, for he includes in his positive reports those which simply declare themselves in favor of further tests. The lack of sufficiently full descriptions of the lesion, especially in pulmonary tuberculosis, and the looseness with which the terms "cure" or "improvement" are used, make it difficult to estimate the value of the reports. The difficulty is enhanced by the very nature of the disease. Moreover, nearly all of the patients treated were at the same time receiving the benefits of the hygienic and dietetic cure. Some authors, it is true, report astonishingly rapid recoveries with practically no interruption of the usual occupation of the patients, and with no essential change in their mode of life. The most enthusiastic advocates of the serum are Frey,[10] and Ullman.[16] More moderately, but still favorably disposed are Hoffa,[17] Monod, Stephani,[18] Röver.[19] The more recent publications are certainly unfavorable, especially those of Sokolowski and Dembinski,[20] Grüner (loc. cit.), Köhler (loc. cit.), Kaufmann,[21] and Ganghofner.[22]

The evidence in favor of the efficiency of the serum is stronger for surgical than for pulmonary tuberculosis, although there is no lack of contradiction even in the surgical group.

Grüner's experience in the treatment of tuberculous meningitis leads him to deny any virtues to the serum. He argues at some length that the serum contains no specific anti-bodies, because when mixed with tuberculin it does not inhibit the latter from producing the von Pirquet reaction. But it is only fair to note that Marmorek especially designed the serum so that it should contain no anti-tuberculin, and it cannot, therefore, be expected to neutralize tuberculin, even if it does contain the anti-bodies planned by Marmorek.

There is now fair unanimity that apart from the anaphylactic effects—which with care can be avoided—the serum is not injurious. Kaufmann, however, in a very recent article dissents strongly. On the basis of his work with Marmorek's serum, and with natural horse-serum, he declares that the heart is frequently injured (this injury, however, he does not attribute to anti-bodies). In fact, a rise of pulse-rate has been noted by many who speak favorably of the remedy. Kaufmann includes among the effects of natural horse-serum (even when given rectally) gastric and intestinal disturbances, nephritis, fever and exacerbation of tuberculous lesions.

Marmorek himself has pointed out that hemoptysis has not occurred during treatment with serum. This was true until Köhler's last series, which, in 60 cases, showed seven with hemoptysis, one of which was fatal.

Evidence has been sought from the laboratory to sustain the claim that the serum contains specific anti-bodies. Röver (loc. cit.), by enumerating leucocytes after Arneth's method, finds that the percentage of neutrophiles with 3- or 4-lobed nuclei rises in patients treated with the serum. Arneth would interpret this as meaning that there was a decreased demand upon the leucocytes for anti-bodies; that is, that anti-bodies were being supplied presumably by the serum. Kaufmann finds the change in the neutrophile picture not so uniform, nor when it occurs, is it always consistent with the clinical phenomena. According to Pfeiffer and Trunk[23] there is an increase in specific agglutinins in the blood of patients under treatment; an increase not accounted for by the agglutinin content of the serum itself, which is rather low. They also demonstrate by the method of complement fixation an increase of anti-tuberculin—which they think may be explained by the presence of small quantities of tuberculin in Marmorek's antigen, or as a group reaction. A rise in the opsonic index is claimed by Bosanquet and French,[24] Baer,[25] and Horner,[26] However, the meaning, if not the very existence, of these laboratory entities is still in question.

All of the patients treated by us received the serum rectally, in accordance with the regulations sent to us by Dr.

[7] Clement and Jacobson: J. des Praticiens, 1908, No. 6.
[8] Grüner: Wien. klin. Wchnschr., 1908, No. 38.
[9] Köhler: Ztschr. f. Tuberk., 1908, Bd. XIII, Ht. 2.
[10] Frey: Ztschr. f. Tuberk., 1908, Bd. XIII, Ht. 2.
[11] Faraggi: Progrès méd., 1907, No. 14.
[12] Kohler, Levy et Jacobson: J. des Praticiens, 1905, December 16.
[13] De la Camp: Berl. klin. Wchnschr., 1905, No. 44.
[14] Stadelmann u. Benfey: Berl. klin. Wchnschr., 1906, No. 4.
[15] Mann: Wien. klin. Wchnschr., 1906, No. 42.
[16] Ullmann: Wien. klin. Wchnschr., 1905, No. 22; Ztschr. f. Tuberk., 1907, Bd. X, Ht. 2; Ztschr. f. Tuberk., 1907, Bd. XII, Ht. 1.
[17] Hoffa: Berl. klin. Wchnschr., 1906, No. 44.
[18] Stephani: Progrès méd., 1905, No. 25.
[19] Röver: Beitr. z. Klinik d. Tuberk., Bd. V, Ht. 3.
[20] Sokolowski u. Dembinski: Ztschr. f. Tuberk., Bd., XIII, Ht. 2.
[21] Kaufmann: Beitr. z. Klinik d. Tuberk., Bd. XI, Ht. 3.
[22] Ganghofner: Wien. klin. Wchnschr., 1909, No. 3.
[23] Pfeiffer u. Trunk: Ztschr. f. Tuberk., 1907, Bd. XI, Ht. 4.
[24] Bosanquet and French: Brit. M. J., Lond., 1907, April 13.
[25] Baer: München. med. Wchnschr., 1907, No. 34.
[26] Horner: Wien. med. Wchnschr., 1908, No. 50.

Marmorek. After a normal evacuation of the bowels, the serum was injected high into the colon by means of a rubber catheter attached to a glass syringe. The dose of serum was followed by enough water to ensure the utilization of the entire dose. The tolerance to this method of administration was excellent. In only one case did we find it necessary to resort to the admixture of laudanum with the serum, on account of a tendency to diarrhœa. In no case did we meet with abdominal pains which might be ascribed to the treatment. In several instances, however, numbness of one or both lower limbs was complained of during treatment. As regards adverse constitutional effects, only in Case X was there a hint of a malignant action on part of the serum. Here, the dose was followed by high fever, anorexia, general pains, increased cough and expectoration.

The amount injected varied from 5 to 15 cc. The dose was regulated by the ability of the patient to retain it, and, as far as we could judge, by the general condition of the patient. As a routine cycle, we adopted a period of 21 days, followed by a pause of 14 days. But these periods were departed from, in individual instances, our guide being the tolerance of the patient for the serum, as far as it could be clinically determined. In one case the serum was given continuously over thirty-five days, with the exception of Sundays.

Our report is limited to 19 cases, all, except one, patients at the Phipps Dispensary. More patients were treated, but on account of the difficulties in properly controlling an outpatient (ambulant) clinic, the treatment in some cases was interrupted at too early a stage to permit of these cases being used in this study. One case was treated for the usual length of time, but immediately after the treatment she succumbed to acute leukemia, and was therefore excluded from the series. As regards the duration of treatment, in some cases this was shortened by the caprice of the patient. The short courses given to the advanced cases were due to the fact that when no antitoxic effect on the symptoms was noticed, we thought it injudicious to expend another course of serum on that patient, since there was no reason then to expect any change in the lungs themselves. To explain the selection of the cases, we may say that the advanced cases were chosen with a view to testing the symptomatic effect of the serum acting purely as a neutralizing agent of the tuberculous toxins. At the instance of Dr. Marmorek, we then treated early cases. Some of these, with no or very few symptoms, we hoped would respond by an amelioration of the physical signs. However, improvement was so slow, if it occurred at all, that we were puzzled as to how much was due to rest and hygiene. For although we made no especial effort to change the mode of life of the patients treated with the serum, yet the daily attendance at the clinic was incompatible with the pursuit of a livelihood. As a result of this doubt, we then treated some patients that had passed beyond the early stage, but were not so sick as the very advanced cases.

A description of each case, somewhat in detail, is given at the end of this paper. We will here summarize the results:

Six advanced cases were treated. Of these, four continued to get worse, even while receiving the serum. Two of these four have since died, one is now dying, and one, while not moribund, is quite sick. These four cases are described as Cases XIV-XVII.

In one of the six, Case XIX, there was apparently no change during treatment, but the physical signs have since become much more marked. Case XX alone showed any beneficial effects. Here, during each course of the serum, there was an amelioration of the cough. The general condition remained unchanged. We may say, then, that out of the six advanced cases, in only one could we detect any favorable effects on the symptoms.

Of the six moderately advanced cases, four (Cases VIII-XI) continued to deteriorate under treatment. Two of these have since died. In Case X, the administration of the last doses of the serum was attended by a sudden exacerbation of the patient's symptoms. In one case (XII) there was no apparent change. Case XIII is the only one of the six that showed any improvement. This case is the most striking of the series in that there was a sudden change for the better simultaneously with the administration of the serum. Unfortunately the patient was so elated at the good results that she refused to return for further treatment. She has since disappeared.

Seven early cases were treated (I-VII). Three of these are worse (III-V). Case III is doing very badly. Case IV has had an extension of the signs, and also pleurisy with effusion. A distressing cough, which was in no wise lessened by the serum, seems to be yielding to tuberculin, which is now being given to this patient. Case V has since died. This patient, while showing only moderate physical signs, went downward with amazing rapidity. Two of the seven (I-II) showed no change under treatment. Of these, Case I had no symptoms, and we were unable to detect any decrease of the pulmonary signs as an effect of the serum. Only two (VI, VII) of the seven cases can be considered as having improved at all, and in both, the decision is rather dubious. Case VI, although having received 330 cc. of the serum, showed an increase of the signs. There was an improvement, however, in the fever, cough and sputum. Case VII received 530 cc., was under treatment 4½ months, and then showed a slight improvement in the signs. The symptoms were not changed. Considering the early stage of Cases VI and VII, and the comparatively long period of care that each had, we cannot see that even the slight beneficial effects can with certainty be ascribed to the serum.

We must conclude that in the seven early cases, we could not definitely ascribe any beneficial effects to the serum. Nor did the serum prevent even some of the early cases from doing badly. No good effects on even slight physical signs were evinced, even when the patient had few or no symptoms. In the twelve advanced cases, only two showed an improvement in symptoms, which might be ascribed to the serum. In the remainder, the severity of the symptoms underwent no dimi-

nution. Of anatomical improvement there was in no case any evidence except in Case XIII. On the other hand, we cannot say that the serum has had any adverse effects.

We must express our thanks to Dr. Marmorek for his kindness in putting the serum at our disposal, and our sincere regret in not being able to confirm the excellent results observed by some writers. A protocol of the cases follows:

CASE I.—No. 3216. M. Z., male, age 21, admitted August 8, 1908. Constitutional and focal reaction to tuberculin.

Lungs.—Right: clear. Left: impaired percussion note and medium-sized moist râles from middle interscapular region to base. On admission had slight cough and hemoptysis. After one month of observation, no symptoms, but the physical signs persist.

Serum.—One course of 210 cc. Duration of treatment 18 days.

Result.—No symptoms. Signs remain unchanged. Patient well.

CASE II.—No. 3203. S. S., female, age 23, admitted August 5, 1908. Just prior to admission had been operated on for pelvic tuberculosis. History of cough for three months and slight hemoptysis.

Lungs.—A few transient râles above each clavicle, and in each supraspinous fossa. On admission had thoracic pains, cough, blood-streaked sputum, and a maximum temperature of 100° F. Weight, 156 lbs.

Between August 8 and August 28, 155 cc. serum. Râles now heard to second rib on each side. Cough and pain unchanged. Temperature, 99.4° F. Weight, 163½ lbs.

Between September 14 and September 23, 70 cc. serum. Temperature, 100° F. Cough and pain worse. Weight, 170 lbs. Slight hemoptysis.

October 16. Weight, 173 lbs. Râles have appeared also in each upper interscapular region. Temperature, 100.4° F.

October 19 to November 9, 205 cc. serum. Temperature not above 99° F. Weight, 173 lbs. Cough bad. Râles in left side now reach to third rib.

March, 1909. Patient in same condition as on admission, except as regards weight. Temperature often over 100° F. Cough and pain unchanged.

Summary.—Pulmonary and pelvic tuberculosis. Gained weight. Otherwise no improvement. Serum 430 cc.—given over a period of twelve weeks.

CASE III.—No. 14. C. S., female, age 38, admitted March 3, 1905. Sputum showed tubercle bacilli. This patient had been receiving tuberculin from July, 1907 until February, 1908, when she began to lose weight, showed fever and an increase of physical signs.

On February 21, 1908, the temperature had risen to 100.4° F. Cough was frequent and troublesome. Weight, 114 lbs.

Lungs.—Right: a few râles in supraspinous fossa. Left: impaired note and moist râles to fourth rib and to middle interscapular region.

February 21 to March 12, 120 cc. serum. Weight, 115 lbs. Fever somewhat lower. Cough and signs unchanged.

March 27 to April 13, 110 cc. Weight, 115 lbs.

May 2 to May 22, 190 cc. Weight, 113½ lbs. Is weak. Cough not improved. Temperature, 100.7° F. Signs increasing.

Summary.—An early case, which had been doing well on tuberculin. A sudden change for the worse, which was not arrested by 420 cc. of serum, given over a period of three months. Patient is now doing badly.

CASE IV.—No. 2736. E. N., female, age 18, admitted April 13, 1908. Sputum shows tubercle bacilli. Gives history of cough for six weeks. Temperature, 101.4° F. Weight, 174 lbs. Bad cough. Appetite poor. Received diagnostic doses of tuberculin.

Lungs.—Moist râles above left clavicle, and from spine of left scapula to base, most numerous in interscapular region.

On July 28, temperature, 100° F. Weight, 162 lbs. Persistent hacking cough. The râles in front now reach to third rib.

July 28 to August 15, 125 cc. of serum. Weight, 165 lbs. Temperature, 99.4° F. Cough still bad. Lungs unchanged.

August 31 to September 18, 155 cc. of serum. Temperature, 99.4° F. Cough is worse. Lungs unchanged. Weight, 165 lbs.

October 13 to November 2, 235 cc. of serum. Temperature, 99.4° F. Cough unchanged. Weight, 166 lbs. Lungs unchanged.

March, 1909. Patient no better. Has since had a large pleural effusion on the right side.

Summary.—An early case with bad cough. No effect on signs or symptoms. Has not done well since. 515 cc. of serum given during twelve weeks.

CASE V.—No. 3237. H. B., male, age 25, admitted August 12, 1908. Sputum shows tubercle bacilli. Duration of symptoms, one year. Temperature, 99.8° F. Weight, 121 lbs. Has bad cough, occasional vomiting and diarrhœa.

Lungs.—Right: impaired percussion note to third rib, and to fourth spine. Breath sounds suppressed. A few fine râles above and below clavicle and in each supraspinous fossa. Left: impaired note, suppressed breath sounds and scant moist râles to third rib and to fourth spine.

August 21. Temperature, 99.8° F. Weight, 118½ lbs. Slight cough. Appetite poor. Vomits.

August 21 to September 10, 180 cc. of serum. Feels stronger. A little cough. Appetite good. Lungs unchanged. Weight, 118 lbs.

October 6 to October 27, 195 cc. of serum. Temperature, 101.6° F. Weight, 113 lbs. Much vomiting. Weak. Lungs unchanged.

November 7. Lungs, same. Looks emaciated. Temperature, 101° F. Much vomiting. Died, December 10, 1908.

Summary.—Early case, with vomiting. Steadily worse. 375 cc. of serum given during nine weeks.

CASE VI.—No. 2466. W. K., male, age 21, admitted February 14, 1908. Sputum shows tubercle bacilli. Symptoms since one year. Has had hemoptysis and cough. Temperature, 99.7° F. Weight, 128 lbs.

Lungs.—Left: clear. Right: slight impairment of note and scant clicks to second rib.

July 21. Fever has continued, although in bed four weeks. Temperature, 100.2° F. Weak, much cough. Weight, 137 lbs.

July 21 to August 10, 125 cc. serum. Fever continues. Cough better. Weight, 138 lbs.

August 25 to September 14, 205 cc. of serum. Fever only occasionally. Cough decreased. Weight, 143 lbs.

Lungs.—Râles much increased to third rib and to lower interscapular region.

March, 1909. Is doing well.

Summary.—Early case. Symptoms improved. Signs increased. 330 cc. of serum during seven weeks.

CASE VII.—No. 2022. M. S., male, age 47, admitted September 17, 1907.

Lungs.—Dullness and moist râles to second rib and spine of scapula on right side. Also a few râles in right interscapular area and at left apex. Steady cough and expectoration. Night sweats. Dyspnea. Poor appetite. Temperature, 100° F. Weight, 136 lbs.

Between December 27 and January 18, 105 cc. of serum.

Between February 6 and February 26, 143 cc. of serum.

Between March 16 and April 4, 150 cc. of serum.

Between April 20 and May 9, 175 cc. of serum.

Duration of treatment, 4½ months. Received 530 cc.

Result.—Cough about same. Appetite bad. Fever only slightly reduced. Weight, 146 lbs. Signs only slightly better.

Patient was then sent to the country and is doing well.

CASE VIII.—No. 2237. C. A., male, age 18, admitted December 6, 1907. Sputum, negative. Bad cough and expectoration. Appetite bad. Sweats. Weight, 104 lbs.

Lungs.—Right: clear. Left: impaired note and moist râles to third rib and to spine of scapula. Also at base of axilla.

January 3 to January 25, 105 cc. of serum. Both signs and symptoms have increased. Weight, 100 lbs.

Patient died.

CASE IX.—M. M., male, age 40, admitted December 22, 1907. Bad cough and expectoration. Weakness. Fever. Loss of weight. Sputum positive.

Lungs.—Right: impaired note and moist râles to third rib and to middle interscapular area. Left: clear.

February 19 to March 11, 125 cc. of serum. Patient is worse in signs and symptoms. Has since died.

CASE X.—No. 3064. A. B., male, age 26, admitted July 3, 1908. Duration of symptoms, four months. Sputum, positive. Frequent cough. Abundant sputum. Temperature, 100° F. Weight, 136 lbs.

Lungs.—Right: impaired note, blowing breath sounds, and moist râles to second rib, and in supraspinous fossa. Left: moist râles and slight impairment from angle of scapula to base.

August 14 to September 1, 160 cc. of serum. Temperature, 101.2° F. Cough increased. Appetite poor.

September 17 to October 6, 115 cc. of serum. Temperature, 99° F. Feels better.

October 27 to October 28, 10 cc. of serum. Fever rises to 104° F. General pain. Anorexia. Increased cough and expectoration. The physical signs have increased on both sides. Weight, 140 lbs. Patient has not been doing well since.

Summary.—Moderately advanced. Received 285 cc. of serum, over ten weeks. Symptoms not at all improved. Physical signs decidedly worse. Last two doses seem to have caused a reaction.

CASE XI.—No. 2236. C. H., male, age 20, admitted December 6, 1907. Sputum positive. Duration of symptoms, six months. Slight cough and expectoration. Weight, 137 lbs.

Lungs.—Right: impaired note to third rib and to fifth spine. Breath sounds blowing. Moist râles in second interspace and in lower axilla. Left: impaired note to third rib and in supraspinous fossa. Breath sounds here suppressed. Moist râles in entire front and to angle of scapula.

January 9. Weight, 140 lbs. No fever. Slight cough. Signs unchanged.

January 9 to January 30, 105 cc. of serum.

February 15 to March 6, 180 cc. of serum.

March 21 to April 9, 135 cc. of serum.

April 27 to May 15, 175 cc. of serum.

May 15. Weight, 134 lbs. No fever. Cough unchanged. Physical signs have increased. Patient has not done well since. Has lost weight and has had hemoptysis and fever.

Summary.—Moderately advanced case, with only slight symptoms and no fever. Was not at work and lived under good conditions. The signs increased under treatment, and patient has not done well since. Received 595 cc. of serum over a period of five months.

CASE XII.—No. 1217. S. P., male, age 19, admitted October 30, 1906. Sputum positive. Received tuberculin treatment from December, 1906, to April, 1907. His physical signs had undergone no change. Had no fever, only slight cough, but showed dyspnea on exertion.

Lungs.—Right: impaired note and moist râles to fourth rib and in interscapular area. Left: no râles, but note is impaired over lobe and breath sounds are suppressed.

August 30 to October 1, 1907, 270 cc. of serum. The dyspnea was not removed. There was no change in the physical signs.

CASE XIII.—No. 2191. L. H., female, age 28, admitted November 21, 1907. Sputum positive. Duration of symptoms, three months. Is very pale. Has much cough and expectoration. Appetite poor. Night sweats. Has lost weight. Now weighs 108 lbs.

Lungs.—Right: impaired note and moist râles to fourth rib and to angle of scapula. Breath sounds roughened. Left: a few crackles above the clavicle.

December 30. Has been on a good diet. Weight, 108 lbs. Cough not better. Dyspnea, chills, sweats, pains. Signs unchanged.

December 30 to January 27, 110 cc. of serum. Pallor has now much decreased. Appetite good. No chills or sweats; cough and sputum decreased. Weighs 108 lbs. Sputum shows no tubercle bacilli.

Lungs.—Right: percussion note and breath sounds unchanged. Râles only above clavicle and to spine of scapula. Left: clear.

March 19, 1908. Signs are increasing, but feels well. Patient has been reported to be doing well.

CASE XIV.—No. 1825. L. J., female, age 20, admitted July 11, 1907. Sputum positive. Duration, six months. Temperature to 99° F. Weight, 109 lbs. Bad cough and expectoration. Dyspnea. Night sweats.

Lungs.—Right: percussion note impaired in both upper backs. Moist râles throughout both fronts and in both upper backs. No tubular breathing.

August 26. Weight, 112 lbs. Pulse, 148. Temperature to 100° F. Symptoms unchanged.

August 26 to September 30, 300 cc. of serum.

September 30. Weight, 111 lbs. Pulse, 144. Temperature, 99° F. Symptoms unchanged. No change in physical signs. Gradually grew worse. Died, December 6, 1908.

CASE XV.—No. 2882. A. T., female, age 18, admitted May 18, 1908. Sputum positive. Duration seven months. Bad cough and expectoration. Hemoptysis. Dyspnea. Poor appetite. Temperature, 100° F. Weight, 99½ lbs.

Lungs.—Right: transient râles to second rib and in supraspinous fossa. Note here markedly impaired. Left: marked impairment of note and moist râles to fourth rib and to upper interscapular region.

May 20 to June 9, 215 cc. of serum.

June 2 to July 3, 75 cc. of serum. The signs have increased. Patient feels worse. Weight, 100 lbs. Has since gone down rapidly.

Summary.—Advanced case. Received 290 cc. of serum in seven weeks. Physical signs worse. Symptoms not improved.

CASE XVI.—No. 1784. C. P., male, age 28, admitted June 22, 1907. Sputum positive. Duration ten months. Bad cough. Hemoptysis. Dyspnea. Temperature, 101° F. Weight, 145 lbs.

Lungs.—Right: a few moist râles above and below clavicle and in supraspinous fossa. Left: moist râles and impaired note to fifth rib and to angle of scapula.

August 28. Temperature, 102° F. Weight, 132 lbs. Marked dyspnea. Chills. Bad cough.

August 28 to September 21, 195 cc. of serum. Symptoms not at all improved. Died October 17.

CASE XVII.—No. 2344. E. K., male, age 22, admitted January 8, 1908. Sputum positive. Duration five years. Temperature, 99.4° F. Weight, 130 lbs.

June 2. Temperature, 100° F. Weight, 130 lbs. Has been taking tuberculin, but has not done well. Pale and weak. Bad cough.

Lungs.—Right: râles to sixth rib and in entire back. Consolidation of upper lobe. Left: râles and impaired note to fourth rib and to angle of scapula.

June 2 to June 20, 130 cc. of serum.

July 6 to July 25, 105 cc. of serum.

July 6. Temperature to 100.2° F. Weight, 124 lbs. No change in cough or strength.

August 11. Physical signs have increased in both lungs. Has since not done well.

Summary.—Advanced case. No improvement in symptoms. Fever not reduced. Lungs much worse. Received 235 cc of serum over seven weeks.

CASE XVIII.—A moderately advanced case which received 125 cc. of serum. This patient is not included in the series, because she died of an intervening acute lymphatic leukemia.

CASE XIX.—No. 1721. J. O., male, age 16, admitted June 15, 1907. Sputum positive. Duration six months.

August 26. Temperature, 100° F. Weight, 79 lbs. Bad cough and expectoration. Night sweats. Poor appetite.

Lungs.—Right: infiltration at apex and base. Left: consolidation over upper lobe. Rest of lung infiltrated.

August 26 to October 1, 200 cc. of serum. No change in signs or symptoms. Patient is now much worse. Large cavity in left lung.

CASE XX.—No. 1542. M. W., female, age 35, admitted March 27, 1907. Sputum positive. Temperature, 100.4° F. Weight, 111 lbs.

February 13, 1908. Has been treated with tuberculin and had attained the weight of 129 pounds. Now weighs 122, has a very bad cough and a temperature of 100° F.

February 13 to March 1, 140 cc. of serum. Cough much better.

May 29. Has had much worry. Cough now very bad. Temperature, 101° F.

May 29 to June 18, 195 cc. of serum. Cough much better. Signs unchanged. Has since grown worse and is not doing well.

Summary.—Advanced case. Received 335 cc. of serum. Cough was much decreased during treatment.

THE EMPLOYMENT OF ARRESTED CASES.[1]

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The wonderful progress of the crusade against tuberculosis is unparalleled. Although it is hard for those of us who are directly interested in the work, and who know how much is yet to be done, to realize how much is already accomplished, still, when the progress is measured with that of other great movements, the contrast is most encouraging.

It is most wonderful that with the rapid growth of the work so few false steps have been made. Starting with the epoch-making discovery of Robert Koch, it has progressed steadily with few, if any, backward steps, until now, before even a generation has passed, it may safely be said that the end of the greatest scourge of civilization is within sight.

Granting that tuberculosis may never be completely eradicated, no one can deny that with the elaboration and strengthening of the means at hand it can be made a negligible quantity, in the causation of human misery and suffering.

The very size of the work is an advantage, for calling, as it does, for the most widespread reforms, it will result in a general uplift of humanity.

It would be well, in studying the question of what to do with the discharged cases, to learn what form of employment is followed by them after leaving institutions. In the great majority of cases the men of the poorer classes change their employment, but this change is not often of any material benefit because the hours are so long and the wages so small that disadvantages of environment are scarcely modified. Positions as street car conductors or motormen, collectors and drivers are being constantly filled by consumptives, and while possibly in many instances life is prolonged, the foregoing causes usually finally result in a reappearance of the disease.

So keen is the competition in the highly organized life of our large cities, and so inimical to health are the homes of the poor, that it is natural that failure is so often the result of the unaided effort of the consumptive to take up the burdens of life anew.

There are two movements taking place in most cities; one, that of the well-to-do toward more commodious and healthy homes in the suburbs, and the other that of the poor toward crowded tenement districts. This latter unfortunate movement is being met by many suggestions, and in some instances by more or less effective measures of relief. The educational work of nurses and charity workers, while palliative, is ineffectual toward removing the cause, and it is only through philanthropic work in building better tenements and municipal reform in better building laws, that material and rapid progress can be made.

Another agency, and the one which is most closely associated with the subject in hand, is the effort to create a movement toward the land.

Many efforts are being made to create a movement of the poor generally toward the country, but the great difficulties in the way render the success of these efforts doubtful. The lack of adequate funds, the ignorance and prejudice of the people themselves, and their lack of training in farm work, and the unpleasant aspects of country life, all tend to retard progress.

[1] Paper read at a meeting of "The Lænnec," a Society for the Study of Tuberculosis, Johns Hopkins Hospital, March 22, 1909.

The point is that the proper handling of tuberculosis will do much to eliminate the difficulties of this work.

It is in this connection that possibly the greatest amount of discussion is going on. Not only does the enforced neglect of bread winning on the part of the consumptive during his treatment in the home or institution throw a heavy burden on others, but his return to less remunerative employment, with the uncertainty of being able to keep it up, is very demoralizing.

While the home treatment of consumptives has many advantages, its action is just as limited as that of the average sanatorium. It calls for an intelligent patient who will follow the directions of the dispensary physician with little supervision, and what is more important, it calls for the assumption of the burden of his support, as well as that of his family, during his enforced idleness, and finally it calls for the readjustment of employment on his discharge. In the great majority of cases it is impossible for him to take up his old work, with all the drawbacks which have caused his breakdown, and it is also impossible to so ameliorate the conditions as to insure his well being. And, as has been said before, the less laborious and trying occupations are so crowded that the lower remuneration will throw him into home surroundings which are impossible.

No doubt the tendency to improvement in living and working conditions is responsible for the reduction in the mortality from tuberculosis, but we should not wait for this reform, and it is obvious that the individuals dealt with, the hopeless, disease-wrecked consumptives, are the hardest to handle.

Not only are the earlier cases with a chance of complete arrest to be considered, but also the more advanced or so-called hopeless cases present a most serious problem. It has long been recognized that favorable environment will often prolong their lives in semi-invalidism for many years. If they are taken from their homes and patched up, only to be returned to the old surroundings, the work has to be repeated over and over again.

I have deemed it advisable to discuss these phases of the problem in order to convince you of the necessity of the adoption of further means in the struggle.

I believe that there is a gregarious instinct in us all which, though it may be very dormant, is still capable of development under proper conditions.

It may be impossible to take the average unintelligent man direct from the city and put him unaided in the country and expect him either to succeed or be satisfied, but this condition does not apply to the consumptive. He has been compelled to give up his old conditions of life, and is bound to acknowledge that under those conditions life has been a failure. He is then in a most receptive state for advice as to a change. He knows, or will later learn, the great difficulty of any rearrangement of duties in city life which will assure his continued health.

Following out this line of argument a number of forces have latterly been at work developing it practically. While lack of funds and appreciation tend to make its progress slow, there is an ever-increasing interest being shown.

In Germany there are land colonies where patients are given small plots for cultivation; in England there are several institutions where work in the soil is required, and in this country there are several already at work. While the work is undeveloped and limited, yet its success is, I believe, assured.

In many institutions basket making, art work, and various crafts have been taken up more with the idea of their therapeutic value than from the point of furnishing permanent employment after discharge. It is obvious that such fields are not large enough for handling the greater number of patients.

On the side of agriculture, however, the field is unlimited and the demand is constantly growing. The rapidly growing industrial centers are constantly calling for an increased development of trucking and market gardening. Abroad, particularly in China and Japan and France, these industries have been carried to a high state of development and are very remunerative. In many cases an entire family is able to gain a living from one acre of land. The work is not laborious, and carried on as it is in the open air, is very healthful. In addition it is extremely interesting and develops skill and intelligence to as great a degree as any of the industrial trades. Two most interesting books in this connection are "Three Acres and Liberty," by Bolton Hall, and "The French Garden," by C. D. McKay, F. R. H. S.

In these books, in detail, are set forth the methods pursued in bringing land to its highest point of productivity. If one is not familiar with the condition surrounding the trucking and gardening industries, it would seem amazing that greater development has not taken place. The average gardeners near our great cities are not men of any education, and they have been content to apply the same principles to their work that their fathers did before them. Agriculture, as a science, has not been recognized outside the agricultural colleges, and these colleges have been poorly patronized. In the last few years, however, these conditions have been changing, and in the Middle West particularly, thousands of farmers and gardeners have been taking courses in these colleges. This awakening is bound to bring about an improvement of conditions of living and employment in this industry, and if the forces in the tuberculosis crusade seize the opportunity much may be made of it.

In addition to this movement there is a constantly increasing demand for improvement in the milk supply. The milk furnished our large cities has been, and is to-day, a great source of infection, and while the conditions have been improved the work is really only begun.

I have tried to make plain that it is essential for the consumptive to modify his old environment, which, as a rule, has led to his downfall; that, as the work is now carried on, he is usually left to his own devices in making the change; and that it is becoming harder and harder for him to find a new work and a new home unassisted and untrained. It is

for this reason that the discussion of farm colonies has assumed such a prominent part in the deliberations of those interested in the work.

Arrested cases may be considered under two general heads; those who eventually may be cured and those in whom the disease will either slowly advance or remain quiescent under most favorable conditions. It is out of the question to keep the first class in a sanatorium until a real cure is completed, and it is also useless to send them back to the same environment. In the farm colony, however, where they may be made self-supporting, their stay may be prolonged until they are sufficiently trained to take up similar work independently, or until their cure is so complete that they may safely battle against their old environment.

For the second class permanent residence in the farm colony is essential. If, after treatment in a hospital, these cases are sent home the almost invariable rule is relaxed, which means either a return to the hospital for another term of expensive treatment or the re-establishment in the home of a center of infection. In a farm colony, however, owing to the endless variety of the work, suitable employment can be found which, to almost the same degree as with the earlier cases, will render them self-supporting.

Granting that such colonies are essential, their location and management are to be considered.

There are two essential points as to location; first, that the land is of such a nature as to be capable of being brought to a high state of productivity, and second, that it be situated close to some large center of population, with adequate and cheap means of transportation. Fortunately, there remain near our large cities many such tracts which may still be bought at a very reasonable figure.

Wherever possible the sanatorium and hospital for advanced cases should be located on the colony property, for while they in all essential points should be made separate and distinct, they can be under the same general management and can draw a large part of their food supply from the farm. This arrangement will also admit of a free and convenient interchange of patients. The farm colony will draw its inmates from the sanatorium and hospital, and in some instances where relapse takes place, the return of the patient for further treatment will be necessary.

In fact the success of the work will be more certain if at first it is only attempted to furnish the two institutions with supplies.

As it takes several years to properly develop the productivity of land, the progress must necessarily be gradual, and this is fortunate, for it gives opportunity for careful planning and false steps are less liable to occur.

The necessary buildings can be erected at a low cost. The quarters for the workers may at first be of the shack type, grouped about a central building containing dining room, kitchen and staff quarters. Later on small cottages should be built where tuberculous families may be quartered. Most necessary is a large barn and stable where the farm products may be stored, and where the stock may be kept. Suitable provisions for hogs and poultry may also be made.

The staff should consist of a superintendent, one or more foremen, and matron and housekeeper. At first medical supervision can be carried on from the sanatorium, but as the number of inmates increases there should be a resident medical officer.

The farm superintendent should, if possible, have had tuberculosis, as it is only by practical experience that a man can be fitted to handle these cases. At first it will probably be impossible to find such a man, as he must also be a competent farmer. As the work develops, however, such a man may be trained. The foremen should be chosen from the most industrious and intelligent of the inmates. Different kinds of work must be carried on simultaneously in different places, and each group should be in charge of a leader.

The general bookkeeping, payment of wages, receiving and assigning of supplies, can best be carried on at the sanatorium.

There is a widespread idea that there is no work going on on a farm during the winter months. This is a great mistake. While it is true that planting and harvest times are the busiest of the year, there is plenty of work at all times. The variety of work in such a colony would be greater than in any other industry. Almost all the trades can find employment. Blacksmiths, carpenters, masons or bricklayers are constantly needed, and if their work is carried on under medical supervision it can be done safely by former patients.

The antebellum plantations possibly furnish the best examples of what can be done in this connection. Many of them contained several hundred slaves with their families, and nearly all of the more intelligent were trained in the special trades, so that each plantation was a self-sufficient community in itself. It is also worthy of note that under these conditions consumption was unknown among the negroes.

Aside from these special trades work on the farm and in the garden affords an endless variety of employment. With the exception of plowing, digging, and heavy lifting, there is nothing laborious about the work, especially about gardening. It is true that the exercise of unused muscles is at first tiresome, but if care is used undue fatigue can be avoided. The success met with by children's gardens in the vacant lots of some of our cities demonstrates the truth of this. The nature of the work also admits of an arrangement of hours to suit each individual case or group of cases. Planting, transplanting, weeding, cultivating, watering, raking, various forms of harvesting, care of stock, etc., afford occupation during the greater part of the year, while during the winter months repairs, hauling and sawing of wood, hauling of other kinds, and preparation for the more active periods take up all the time.

The problem of the care of women is not hard to solve in such a colony. The housework, cooking, care of poultry, laundry, mending and sewing, all carried on under hygienic conditions, afford them employment. If the proper morale is maintained many of them will take up light gardening, flower raising, etc.

When more than one member of the family is tubercular, as is usually the case, the problem of properly caring for them is always greatly magnified. Their removal from their homes not only entails expense for their care, and of the members of the family who are not breadwinners, but their return usually means the infection of those as yet free from the disease.

If cottages for such families be built the family relations may be maintained without the demoralization and expense attending the separation of children from their parents, and at the same time the health of these children can be assured.

It is an established fact that three or four people can be maintained on an acre of land.

Undoubtedly the prime requisites for the success of any such scheme are the application of up-to-date scientific methods of agriculture, the best possible business methods and the most conscientious supervision of the inmates.

As has been said before, scientific methods are only beginning to be applied to agriculture. The oldest of the arts of man is the least developed. Yields of from $1000 to $2000 to the acre are not only possible, but are becoming the rule under the most favorable conditions. Small fruit, asparagus, tomatoes, and early vegetables raised under glass pay very large profits. And the demand is so universal that they must continue to do so.

In no other situation is good business management needed more. The endless detail and great amount of planning needed make it essential, and without the sympathetic, careful supervision of the workers, although the other requisites are present, the plan must fail.

The point may be raised that great danger attends the handling of any food products by consumptives. If this were true, it could certainly be no worse than at present, when there is absolutely no supervision of these cases. It will always be essential that the final handling of food products be done only by arrested closed cases. This will not be hard to do, as the cases of open tuberculosis in such a colony would be few, as most of them would have lost their bacilli before leaving the hospital, and such cases as there are can be given employment where they can avoid any direct contact with food products. In addition, of course, there will be constant supervision and the utmost care in the disposal of sputum.

In opposition to any such schemes as these it is usually claimed that it is impossible to persuade the cases desired to be reached to leave the allurements of city life, and even if they are persuaded it is impossible to hold them. For the most, I believe that the unwillingness on the part of these people is due to their natural distrust of charitable organizations and philanthropists, to the necessary separation from their families, and to the supposed hardships and loneliness of country life.

Under the conditions I have outlined these objections are obviated. When the first change from the home to the sanatorium is made the rest is but a step, and the patient has opportunity to accustom himself to new conditions and to realize that his fears are groundless.

If he refuses at first to acquiesce to the plans, one relapse, after his return to his old environment, will be sufficient to convert him.

It cannot be denied that these cases must be cared for, and if this is admitted, then the farm colony presents the most feasible and economical means of care.

I have no doubt that my article so far may be criticised for being entirely theoretical, but I have chosen purposely to discuss the subject first in a general way before presenting any direct evidence as to its feasibility.

For the past three years we have been working along this line at Eudowood, and while we have been greatly hampered by lack of funds, I believe our results have justified everything I have said so far.

We first, by co-operation with the Phipps Dispensary, filled our sanatorium with incipient cases and applied, as far as possible, the system of graduated work so successfully employed by the Frinley Sanitarium in England and at White Haven in this country. We then had some 50 acres, but the soil was in a very depleted condition. With the aid of our patients and two healthy negroes, who did the heavy work, we commenced operations. During this year the expenses and profits about balanced. During the second year we built a large barn and stable and added a herd of cows. We added to our paid employees two former patients and continued to require work of all suitable cases in the sanatorium. One of the two cases we employed had been a molder and the other a potter. The former molder was reared in the city and knew nothing of country life. We put him in charge of the stable and cows, and his work has been eminently satisfactory. His wages at first were $12 a month, and he is now getting $20.

While the other man had lived in the country when a boy, most of his life had been spent in the city. He is intelligent and seems to possess a special aptitude for agriculture, and at the beginning of this year he was made farm superintendent.

During the second year the farm produced about $4000 worth of products at a cost of about $3400.

During the year just passed we established the farm colony as a separate institution. Through the generosity of one of our directors, Mr. Robert Garrett, we were enabled to secure a large farm adjoining our property at a low rental.

The buildings consist of a comfortable farm dwelling, a large barn and cow stable, horse stable, chicken houses, etc. There are about 100 acres of arable land which, with that on our own property, will give us 150 acres for cultivation. There are also about 100 acres of woodland and pasture. The location is ideal, the land is rolling and well drained, capable of being brought to a high state of productivity. The property is 500 feet above the sea, 7 miles from the center of the city, and 1¼ miles from the village of Towson. There are excellent transportation facilities and a ready market for any surplus we may produce. The farm buildings are about half a mile from the sanatorium.

Here, in the spring of last year, we established our little colony of ten men under the direction of a practical farmer.

Of these ten men four had been tailors, one a shoemaker, one a molder, one a potter, one a blacksmith, and one a school boy. Two were of native American stock, one of Russian-Jewish parentage, one Polish, one Roumanian, three Irish, and two German.

Five were apparent cures, four moderately advanced arrested cases, and one far-advanced arrested case. None of them had had tubercle bacilli in their sputum for some months previous. They were all enthusiastic over the experiment and were willing to take up the work on the promise that they would receive wages as soon as possible. As none of them had families dependent directly upon them, we felt justified in taking them on these terms. Only two, who had been working for some time previous, received wages. While we would have liked to have given them all some remuneration the scarcity of funds forbade it. Since the first of this year, however, we have been giving the men $10 a month, with the promise of further increase as soon as possible. Of the ten men all remained faithful except two. One secured a position on a neighboring farm and left with our full consent. Another left and joined the navy, but returned in about two months with some symptoms following a hemorrhage. After a period of rest in the sanatorium he was sent back to the farm, where he has since done well.

All of the cases have improved, and in spite of the fact that last year we could not pay them anything, and that we had a hard time finding clothing and shoes for them, they have been remarkably faithful and contented.

While the farm superintendent was a good farmer, he was lacking in executive ability, and was not able to get on well with the men. At the beginning of this year he left, and one of the men of whom I have spoken above, a former potter, was put in his place. This man had been working on the farm for two years and had been studying every book on agriculture he could get. The work is progressing most satisfactorily under his charge, and he has the confidence of the men.

Last year we raised about $6000 worth of farm products at a cost of about $5000. Much has had to be done which will not show immediately, in the way of preparing the land for greater productivity. We set out last fall 500 fruit trees and a large area of berries. We furnished the sanatorium with all its vegetables and milk, and sold a large surplus of vegetables. Four hundred gallons of tomatoes and a large amount of fruit were put up for winter use.

The cooking is done by a former patient whose husband is a patient in the hospital for advanced cases. One of her children is a patient in the sanatorium. We expect shortly to send the husband to the colony. This family had been a burden to the charity organization for three years. While they were willing to work, their physical condition was such that nothing suitable could be found.

We have another family which we expect to take as soon as room can be made. The father has incipient tuberculosis and was a former patient at the sanatorium. He has returned to his old home, but is not doing well at inside work. The mother is an old chronic case and is compelled to do the housework; one child is a patient in the sanatorium and another is on the waiting list.

There is no question that when we have brought the mother to the hospital and put the man to work on the farm that one focus of infection will be destroyed, and at the lowest possible cost.

It is said of a good many successful results achieved in different lines that they are due to personality. This is certainly not true of our work. The former farm superintendent had a very unfortunate personality, and I have often heard my own criticised. The work is successful because it is organized on rational business principles, and because it is the most simple and practical solution of the problem.

I want to say one word in regard to our patients. They are not of the highest order of intelligence, and were not specially selected, but they are ordinary human beings and can be handled just as well by any employer. They are not being pauperized.

I have endeavored to bring out the following points:

Agriculture presents the best form of exercise for tuberculous cases from a therapeutic as well as an economic standpoint.

The farm colony is not only the best possible means for the after-care of consumptives, but also, as it develops, will be the best agent for encouraging the much-wished-for movement toward the land.

These colonies, if properly located and managed, can be made self-supporting.

They present the only way for handling tuberculous families.

They should be located in close conjunction with a sanatorium and a hospital for advanced cases, and should also be near large centers of population.

No work should be undertaken without endeavoring to keep the entire program in sight.

It is not claimed that the farm colony will solve the tuberculosis problem, but that it is essential to have it in cooperation with all the other necessary forces.

I have endeavored to establish two points; first, that the colony is necessary and practical, and, second, that it can be made self-supporting.

If we have succeeded in our modest experiment, unaided by past experience and retarded by lack of funds, there is every assurance for success where ample funds are at hand.

I trust I may be pardoned for presenting this dry sociological paper at this meeting, but I believe that such subjects concern the doctor almost as much as medicine does, certainly in connection with tuberculosis. Perhaps few of my hearers will ever achieve much in the laboratory struggle against tuberculosis, but every physician, if he will do all in his power to help those directly engaged in the fight, with the every-day methods at hand, can do much.

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